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Assessment of the Status of Divisions 4X5Y Haddock in 2005

Évaluation de l'état du stock d'aiglefin des divisions 4X et de 5Y en 2005

P.C.F Hurley, G.A.P. Black, G.A. Young, R.K. Mohn, and P.A. Comeau

Population Ecology Division
Bedford Institute of Oceanography
1 Challenger Drive, P.O. Box 1006
Dartmouth, NS B2Y 4A2

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ABSTRACT

Landings of 4X5Y haddock in the fishing year ending 31 March 2005 were 5,946t, relative to a quota of 10,000t. The 1998, 1999, 2000 and 2003 yearclasses are all strong. Spawning stock biomass increased to 54,000t in 2003 and has decreased slightly in 2005. Since 1994, fishing mortality has been below $F_{0.1}$. Relative fishing mortality shows a declining trend on the Scotian Shelf, but remains relatively stable in the Bay of Fundy. Exploitation in the Bay of Fundy may be too high and is hampering rebuilding. If catches are maintained at the current TAC of 8,000t, fishing mortality will remain below $F_{0.1}$ and spawning stock biomass will decrease from 2006 to 2007. Mean sizes-at-age in the RV survey have been decreasing since the mid-1970s, and many ages are at or near the smallest size observed in the time series. Under the current growth regime, productivity is about two thirds of what it was in the 1970s. There would be no increase in yield by delaying harvest of this resource to older ages. The achievement of rebuilding objectives for cod and pollock may constrain the harvesting of haddock.

RÉSUMÉ

Les débarquements d'aiglefin en provenance de 4X et de 5Y au cours de l'année de pêche qui a pris fin le 31 mars 2005 se sont chiffrés à 5 946 t, par rapport à un quota de 10 000 t. Les classes d'âge de 1998, 1999, 2000 et 2003 sont toutes fortes. La biomasse du stock de reproducteurs a augmenté à 54 000 t en 2003, puis a légèrement diminué en 2005. Depuis 1994, la mortalité par pêche est inférieure à $F_{0.1}$. La mortalité par pêche relative affiche une tendance à la baisse sur le plateau néo-écossais mais elle demeure relativement stable dans la baie de Fundy. L'exploitation dans la baie de Fundy est peut-être trop élevée et freine le rétablissement. Si les prises se maintiennent au niveau du TAC actuel (8 000 t), la mortalité par pêche demeurera inférieure à $F_{0.1}$ et la biomasse du stock de reproducteurs diminuera de 2006 à 2007. Les tailles moyennes par classe d'âge selon les relevés effectués par les navires scientifiques (NS) sont en baisse depuis le milieu des années 1970 et, dans de nombreuses classes d'âge, la taille observée est la plus basse ou s'approche de la plus basse de la série chronologique. Dans le régime de croissance actuel, la productivité se situe à environ deux tiers de ce qu'elle était dans les années 1970. On n'obtiendrait pas de hausse du rendement à attendre que le poisson soit plus âgé pour le capturer. La poursuite des objectifs de rétablissement de la morue et de la goberge pourrait restreindre la pêche de l'aiglefin.

INTRODUCTION

This research document contains an evaluation of the haddock stock on the southern Scotian Shelf and Bay of Fundy (Northwest Atlantic Fisheries Organization [NAFO] Division 4X). As in previous assessments of this stock (Hurley *et al.* 2003, 2002, 1999), haddock caught by Canadian fishers in NAFO Division 5Y are included in the management unit. Haddock in the Bay of Fundy area grow faster than haddock on the southern Scotian Shelf. As a result, haddock landings from divisions 4Xmnop and 4Xqrs5Y are handled separately, and separate age/length keys are used for landings from the 2 areas, designated as Scotian Shelf and Bay of Fundy stock components, respectively (Figure 1). Similarly, haddock catches from the summer research vessel (RV) survey stratas 470-481 and 482-495 are handled separately, as Scotian Shelf and Bay of Fundy components (Figure 2). In 1999, the fishing year changed from January to December to April to March.

Quota management was introduced for this stock by International Council for the Northwest Atlantic fisheries (ICNAF) in 1970, and a seasonal spawning closure was instituted that same year. The current closure extends from February 1 to June 15. The history of this area closure is documented by Halliday (1988).

The rationale for this assessment was a request by Department of Fisheries and Oceans (DFO) Fisheries Management for advice on the stock status of haddock in 4X5Y in order to determine a Total Allowable Catch (TAC) that would be consistent with the management plan. Specifically the remit for the assessment was: evaluate the completeness and accuracy of fisheries statistics for haddock in 4X5Yb for 2004/05, commenting on implications for status determination; given apparent changes in growth rate and productivity of the 4X haddock resource, describe the implications for harvest strategy; and determine if the biomass and fishing mortality rate of haddock has increased or decreased. Evaluate the prospects of rebuilding if catches are maintained at the current TAC of 8,000t. Provide details for the Bay of Fundy and Scotian Shelf separately.

This assessment includes the summer RV survey data from the current year, together with commercial landings data for the first half of the year and port samples of those landings, to determine stock status in the current year and make yield projections for the fishing year 2006/05. The results of an industry survey were also used in the assessment.

THE FISHERY

The long-term (1948-2004) reported annual landings of haddock in 4X5Y average about 18,000t. Landings exceeded 30,000t during the mid- to late 1960s, and again during the early 1980s (tables 1 and 2; Figure 3). Landings have been less than 11,000t since 1988. Landings were 6,800t in 1989, when it was recommended that the fishery be maintained at the lowest possible level, and the mobile gear fleet was closed in mid-season. Landings increased from 1989 to exceed 10,000t in 1992 under a Management Plan that called for a bycatch fishery only. Landings in 1994 were 4,406t, the lowest in recent history, under a quota of 4,500t and implementation of stringent fishing plans. Quotas have not been exceeded since then. The TAC of 8,100t established for the 12-month fishery in 1999 was extended to 9,800t for the 15-month period ending 31 March 2000, based on the proportion of landings in the first quarter of the year over the previous 10 years. The fishing year since then has been April 1 to March 31.

Landings of 4X5Y haddock in the fishing year ending 31 March 2005 were 5,946t, relative to a quota of 10,000t. Following recommendations from Industry, the quota in the 2005/06 fishing

year was reduced to 8,000t. Landings for the current fishing year to 27 October 2005 were 3,265t, about the same as last year for the same period (Table 3). Low fish prices and high fuel, insurance, and bait costs have all contributed to the shortfalls. In 2005, there are reports from the mobile gear sector that there have been difficulties locating concentrations of large haddock in the Bay of Fundy.

The fishery was dominated by the mobile gear sector between 1977 and 1989 (Table 4; Figure 4). Between 1990 and 1994, the fixed gear sector took a larger proportion of the landings, however, the proportion taken by the mobile gear sector has increased since, and was 82% in 2004. Fixed gear landings are primarily from longlines. Landings by handlines have been small and have been declining since 1994.

Recent changes in the management of the fishery have had a significant impact on the timing of the fishery. The change to an April-March fishing year in 2000 resulted in an increase in the proportion of fish landed during January to March (Table 5; Figure 5). Both the mobile gear and fixed gear sectors indicate this is due primarily to the ability to direct for haddock with a minimal bycatch of cod.

This change in timing of the fishery has also led to changes in the distribution of catches. The proportion of catches from 4Xn and 4Xp has been increasing in recent years (Table 6; Figure 6). While the increase in 4Xn is largely a result of the increase in the winter fishery, the increase in 4Xp reflects directing for larger haddock in deeper water, which generally returns higher market value, and also is an area in which the bycatch of cod is relatively low.

The number of vessels active in the groundfish fishery in 4X has decreased for all gear types over the last decade, particularly for the handline fleet, and these data, and the data available to date, for days fished suggest that there has been a substantial decrease in effort in the groundfish fishery again in 2005 (Table 7).

Haddock is landed as part of a mixed species groundfish fishery in 4X (Table 8). The species composition by gear type of reported groundfish landings for the fishing years 1992, 1997, and 2002/03 to present show that there have been changes over the period for each gear type. This is a simplistic analysis in that it does not take into account that vessels licensed to fish for groundfish direct for a variety of different species (cod, haddock, pollock, silver hake, redfish, flounders, sculpin, halibut, dogfish), but it gives some indication of changes in the species composition of landings in the groundfish fishery and of the overall decrease in landings in the fishery over the last 15 years. Note that only species considered groundfish were included in the analysis, and that it does not reflect all species caught or landed by groundfish vessels.

Further details of the groundfish fishery can be found in other groundfish stock assessment documents, in particular for 4X cod (Clark 2005), pollock (Neilson and Perley 2005), white hake (Bundy and Simon 2005), and silver hake (Showell *et al.* 2005).

DATA

Size and Age Composition of the Catch

Port samples of landings were used to construct a catch-at-age as in previous assessments of this resource. The age composition was derived by application of age/length keys to length frequencies, stratified by quarter and gear. Due to differences in growth rates between haddock on the Scotian Shelf and in the Bay of Fundy, landings are separated into 4Xmnop and 4Xqrs5Y, and separate age/length keys were used, whenever possible. When insufficient samples were available to satisfy the stratification, length frequencies were aggregated and a common age/length key was applied. In some cases, a key from 1 gear, quarter, or area was applied to another, where no otoliths were available. The gear and quarter aggregations used to construct the catch-at-age for 2004 and the first half of 2005 are shown in Table 9.

There was one change in the construction of the catch-at-age in this assessment. In previous assessments of this stock, seasonal (quarterly) length/weight parameters derived by O'Boyle *et al.* (1983) had been used throughout the time series. During the last assessment (2003), concern was expressed with the use of these constant quarterly length/weight parameters, given the declining trends in weights-at-age that have been observed in this stock. Therefore, the catch-at-age was constructed using both annual length/weight parameters calculated from the summer RV surveys, for each stock component each year, and using the constant quarterly parameters for all years. Where aggregation was necessary, gear and quarter aggregations of length frequencies remained the same. This was done back to 1990, which coincides approximately with the most recent period of decreasing trends in size-at-age. The resulting changes in catch-at-age were small, with a change in overall catch numbers of 1% in the early part of the period, but becoming more pronounced later in the period resulting in increases in overall catch numbers of as much as 10% (Table 10). The results of an Sequential Population Analysis (SPA) conducted with the new catch-at-age were very similar to the results obtained using the catch-at-age, which used the seasonal length/weight parameters from O'Boyle *et al.* (1983) (Figure 7). It was concluded that the use of annual length/weight parameters was more appropriate.

As a routine check, the primary ager reads the 4X haddock otolith reference collection. A pair-wise comparison of ages showed high precision and little bias, with an overall coefficient of variation of 1.6% (Figure 8). These results were considered acceptable.

The resulting catch-at-age is shown in Table 11, and the age composition is shown in Figure 9. A comparison of the age composition of the projected catch-at-age from the last assessment, with the actual catch-at-age for 2003 and 2004 and the first half of 2005, suggests that partial recruitment may have increased from age 5 and 6 year old fish (Table 12; Figure 10).

Mean weights-at-age in the commercial landings have been variable with a modest decline since the early 1990s (Table 13; Figure 11). The age 5 and younger weights-at-age in recent years are similar to those in the 1970s, but ages 7 and older are very low compared to the late 1970s and early 1980s. Similar declines in weights-at-age have been observed for haddock on the eastern Scotian Shelf (Mohn and Simon 2002, Frank *et al.* 2001).

The 1998 and 1999 yearclasses made up more than half of the 2004 catch by weight. The 2000 yearclass recruited to the fishery in 2005 and made up 25% of the half year 2005 catch by weight. As these yearclasses dominate the fishery, the proportion of small (<43cm) fish in the catch has increased. Over the last 3 years, the proportion of small fish in landings has

increased, and more than 50% of second quarter landings from the Scotian Shelf were less than 43cm (Figure 12-14).

The size composition of haddock in port (shore) samples and observer (at-sea) samples in 2004 and the first half of 2005 were compared to address to question of discarding of small haddock. Where samples were available, these comparisons were made for otter trawl and longline samples separately, by quarter and area (figures 15 and 16). The size compositions were in most cases quite similar, and in some cases, the proportion of small fish in the shore samples was greater than in the at-sea sample. Although observer coverage of the groundfish fishery in 4X5Y has been low (only 3% of haddock landings, usually from small trips, in 2004 and 2005) (Table 14), it was concluded based on these comparisons and the large proportion of small fish in the landings that there was no evidence to indicate discarding of small haddock was occurring. This was supported by comments from industry during the Data Inputs meeting and the Regional Advisory Process (RAP) assessment review (DFO 2005). There are no other reasons to conclude that landings data for 4X haddock in 2004/05 are incomplete or inaccurate.

Research Vessel Surveys

A bottom trawl research vessel survey of the Scotian Shelf and Bay of Fundy has been conducted in summer since 1970. The stratification scheme used in the depth stratified random survey design is shown in Figure 2. A vessel conversion factor of 1.2 was used for the *A.T. Cameron* surveys (Fanning 1985). Catches of haddock in the 2004 and 2005 summer RV surveys are shown in Figure 17.

Stratified mean number and mean weight per standard tow declined from the high levels observed in 1999-2001, and both indices were below the long-term mean in 2005 (Table 15; Figure 18). Catches in the Scotian Shelf component (stratas 470-481) have shown an increasing trend over the last decade and are near the long-term mean in recent years, while catches in the Bay of Fundy (stratas 482-495) remained relatively stable, but are below the long-term mean in recent years (Table 15; Figure 19). Age 4+ biomass, considered an index of spawning stock biomass, shows similar trends (Table 15; Figure 20). The proportion of 4+ biomass in the Scotian Shelf component has been increasing over the last decade, and is high in 2005 (Table 15, Figure 21).

Stratified mean number-at-age per standard tow from the summer RV survey (Table 16), an input into the population model, when separated into stock components indicates an expanding age range in the Scotian Shelf component in recent years, while the age range for the Bay of Fundy remains truncated (Figure 22).

Mean lengths-at-age in the summer RV surveys decreased through the mid- to late 1980s, more so in the Scotian Shelf component than in the Bay of Fundy. Some recovery occurred in the late 1980s and early 1990s, but not to the sizes observed in the earlier period. Mean lengths-at-age have been decreasing since the early to mid-1990s, particularly at older ages (Table 17; Figure 23). Mean weights-at-age show similar trends (Table 18; Figure 24). Many ages are at or near the smallest size observed in the RV time series. Although sizes-at-age are larger in the Bay of Fundy and the decreases have been less extreme, older ages are also at or near the smallest sizes observed in 2005.

An index of fish condition, predicted weight at 50cm calculated from the summer RV survey has shown a decreasing trend since the early 1980s (Figure 25). This index indicates that, as well as getting smaller at age, fish are getting 'slinkier'. The Scotian Shelf index has shown some increase in the last 3 years and the Bay of Fundy index, which has traditionally been higher, is

now lower than that for the Scotian Shelf. Dutil and Lambert (2000) demonstrated that low condition can be related to poor reproductive success in Atlantic cod. However similar experiments have not been conducted for haddock but should be. It would appear that the levels observed here for 4X5Y haddock have not affected reproductive success. However, poor condition does reflect low production.

An examination of the length composition of the summer RV survey haddock abundance indicates that the population is dominated by small fish (<43cm) (Figure 26). In 2005, 84% of haddock (by number) caught on the Scotian Shelf were <43cm, well above the long-term mean, while 57% of the haddock caught in the Bay of Fundy were <43cm, above the long-term mean.

Recruitment indices, calculated as mean number-per-tow ages 1 and 2 for a yearclass from the summer RV survey, show that the 1998, 1999, and 2000 yearclasses have all been very strong; but when separated into Scotian Shelf and Bay of Fundy components, only the 1998 yearclass was strong in the Bay of Fundy (Figure 27).

Total mortality (Z) estimated for ages 5-7 (historically fully recruited) from the summer RV surveys was relatively stable in recent years, with an implied fishing mortality of about $F_{0.1}$ (Figure 28). Unlike a number of other stocks on the Scotian Shelf, this estimate of total mortality does not suggest that natural mortality for 4X5Y haddock has increased in recent years. Relative fishing mortality, calculated as total landings divided by ages 4+ RV survey biomass, shows a declining trend on the Scotian Shelf, but remains stable in the Bay of Fundy (Figure 29).

Industry Surveys

The mobile gear <65 ft (ITQ [Individual Transferable Quota]) fleet has conducted a joint resource survey of the 4X5Y area with DFO since the summer of 1995. The survey is conducted in July, the same time that the DFO research vessel survey is conducted, by 3 draggers (<65 ft) equipped with standardized gear with the same size codend liner as used in the RV survey. A fixed station design, based on the RV survey strata, is used and standardized tows are made. The survey is designed to cover the entire 4X area, included a large inshore area off southwest Nova Scotia that is not covered by the RV survey. Further details are summarized in O'Boyle *et al.* 1995 and Hurley *et al.* 1999. Due to changes in the survey design between 1995, the first year of the survey, and subsequent years, the 1995 survey was not used in the time series here. Catches of haddock in the 2004 and 2005 ITQ surveys are shown in Figure 30.

Mean number and mean weight per standard tow have declined from high levels observed in 1999-2001, similar to the RV survey, and are the lowest observed in the 10 year time series in 2005 (Figure 31). The trends in 4+ biomass from the ITQ survey, separated into Scotian Shelf and Bay of Fundy components, show similar patterns in both areas, but levels in the Bay of Fundy were very low in 2005.

Mean number-at-age per standard tow from the ITQ survey (Table 19), when separated into stock components indicates a wider age range in the Scotian Shelf than in the Bay of Fundy (Figure 32).

Recruitment indices, calculated as mean number-per-tow ages 1 and 2 from the ITQ survey, show that the 1998, 1999, and 2000 yearclasses have all been strong; but when separated into Scotian Shelf and Bay of Fundy components, only the 1998 yearclass was strong in the Bay of Fundy (Figure 33).

ESTIMATION OF STOCK PARAMETERS AND RESULTS

A traditional age-based Sequential Population Analysis using the ADAPT framework (Gavaris 1988) was used to produce estimates of population abundance in numbers. The SPA model used is as follows:

Parameters:

Population numbers at mid-year $N_{i,2005}$ i = 2-10
Calibration coefficients $q_{1,i}$ i = ages 2-10 for July RV survey
$q_{2,i}$ i = ages 2-10 for ITQ survey

Structure imposed:

Error in catch assumed negligible
Partial recruitment fixed for age 1 in 2005
F on oldest age (10) set as average F of ages 8-9 adjusted by the partial recruitment of age 10 in 2005
No intercepts were fitted
M = 0.2 for all ages

Input:

$C_{i,t}$ i = 1-10; t = 1970 to 2005 - catch-at-age for entire year (half year for 2005)
$J_{i,t}$ i = 2-10; t = 1970 to 2005 - July RV survey index
$ITQ_{i,t}$ i = 2-10; t = 1996 to 2005 - ITQ survey index

Objective function:

Minimise $\{ \sum\sum (\ln J_{i,t} - \ln q_{1,i} N_{i,t})^2 \} + \{ \sum\sum (\ln ITQ_{i,t} - \ln q_{2,i} N_{i,t})^2 \}$

Summary:

Number of observations:	324 for July RV (9 ages by 36 years)
	90 for ITQ (9 ages by 10 years)
Number of parameters:	27, 9 ln Ns estimated by NLLS, 18 qs algebraically

age	1	2	3	4	5	6	7	8	9	10
partial recruitment	.0001	.033	.118	.452	.884	.972	1.00	1.00	1.00	1.00

The SPA inputs, commercial catch numbers-at-age, RV survey stratified mean numbers-at-age per tow, and ITQ survey mean numbers-at-age per tow, are shown in tables 11, 16, and 19, respectively. Residuals from the model fit and summary statistics of overall fit of the model are shown in Table 20a and Figure 34. The resulting estimates of population numbers, biomass, and fishing mortality are shown in Table 20b-d. As with previous assessments of this resource, the residuals show some strong year effects, with positive residuals at all ages in some years and negative residuals at all ages in other years (Figure 34).

Estimated recruitment in this stock was high through the 1970s and into the early 1980s (Table 20b; Figure 35). This was followed by a 10-year period of below average recruitment from 1983-92, although the 1987 and 1988 yearclasses were near-average in strength. This has been followed by a period of relatively good recruitment. The 1998 yearclass is estimated to be the strongest since 1970, at 63 million at age 1, and the 1999 yearclass is estimated to be the third strongest. The 2000 yearclass is above average, and the 2003 yearclass is also estimated to be strong.

Spawning stock biomass (ages 4+) decreased from a peak in 1979, and reached a low of 22,000t in 1990 (Table 20d; Figure 35). Spawning stock biomass is estimated to have increased to 54,000t in 2003, and to have decreased slightly in 2005.

The exploitation rate on ages 5-7 (historically fully recruited) increased from the 1970s to approximately 50% in the early 1980s (Table 20c; Figure 36). It declined to close to $F_{0.1}$ (20%, currently used value of $F_{0.1}$=0.25) in the late 1980s and dropped below $F_{0.1}$ in 1994, and has remained low.

Past assessments of this resource have exhibited a strong retrospective pattern, where exploitation is under-estimated and population abundance is over-estimated in the current year, relative to when additional data are available in subsequent years. The pattern of exploitation estimates in this case is variable and does not show a consistent over- or under-estimation (Figure 37). The biomass estimates do exhibit a consistent pattern of over-estimation of population abundance in the most recent year, particularly when strong yearclasses occur. Retrospective estimates of yearclass size indicate that early estimates of large yearclasses may be over-estimated by a factor of at least 2, and that this pattern of over-estimation can persist at older ages (Figure 38) (Hurley *et al.* 2003, 2002, 1999). This analysis estimates the 2003 yearclass to be very strong, which may produce this retrospective pattern again.

Following the methods of Mohn and Chouinard (2004), a surplus production analysis showed that productivity in this resource is presently about two thirds of what it was in the 1970s (Figure 39), caused mainly by the decrease in growth (Figure 40). A yield per recruit analysis indicated that, under the current growth regime, there would be no increase in yield by delaying harvest of this resource to older ages (Figure 41 and 42); however, the harvesting of small fish would have implications to future spawning stock biomass and other aspects of production.

OUTLOOK

Projected yield and spawning stock biomass were calculated using recent mean weights-at-age (average of the last 3 years). Weights-at-age in this resource have been declining since the mid-1990s. If this trend continues, then yield and spawning stock biomass will be over-estimated.

Previous assessments of this resource have shown that, with this assessment model, there is a tendency to over-estimate the size of large yearclasses (Hurley *et al.* 2003, 2002, 1999). Retrospective estimates of yearclass size indicate that early estimates of large yearclasses may be over-estimated by a factor of at least 2. The 2003 yearclass is estimated to be very strong. As a result, a Gompertz model fit to contemporaneous and converged estimates of abundance at age from retrospective SPA runs was used to reduce the estimate of the 2003 yearclass at age 2 from 32.5 million to 19 million in the projection calculation (Figure 43).

The projected yield at F=0.25 (which is currently used for $F_{0.1}$) for the 2006 fishing year is 9,600t (Figure 44), and the projected spawning stock biomass (ages 4+) at the beginning of the 2006 fishing year is 37,000t.

If catches are maintained at the current TAC of 8,000t, fishing mortality will remain below $F_{0.1}$, and spawning stock biomass will still decrease from 2006 to 2007 (figure 44 and 45). Part of this decrease is attributable to the progression of the recent strong yearclasses through the population.

The reference to 'rebuilding' in the remit requires clarification as the biomass is estimated to be high relative to the assessment time series, at or near expected levels given current growth and moderate fishing. For populations where the abundance and biomass are near the equilibrium level associated with the F reference, fluctuations in biomass are expected and may not be of concern. The industry perspective that haddock needs rebuilding is perhaps based on absence of haddock from traditional grounds and smaller size of fish in the catch, but this may be confounded by fishers engaged in other fisheries.

The RV and ITQ surveys suggest that the proportion of biomass in the Bay of Fundy is decreasing, while the proportion of the commercial catch coming from the Bay of Fundy is increasing. The recruitment indices, age structure, and estimates of relative fishing mortality by area suggest that exploitation in the Bay of Fundy may be too high and is hampering rebuilding and expansion of the age structure of the population in this area.

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Table 1. Reported nominal catch (t) and TAC of haddock from NAFO Division 4X (Canadian landings include Div. 5Y).

Year	Annual Catch	TAC	Fishing Year** Catch	TAC	
1960	15800				
1961	17918				
1962	18032				
1963	24461				
1964	36049				
1965	29166				
1966	43349				
1967	37896				
1968	32602				
1969	30703				
1970	18072	18000			
1971	17592	18000			
1972	13483	9000			
1973	13106	9000			
1974	13378	0			
1975	18298	15000			
1976	17498	15000			
1977	21281	15000			
1978	27323	21500			
1979	25193	26000			
1980	29210	28000			
1981	31475	27850			
1982	25729	32000			
1983	27405	32000			
1984	21156	32000			
1985	16131	15000			
1986	15555	15000			
1987	13780	15000			
1988	11272	12400			
1989	6800	4600			
1990	7556	4600			
1991	9826	0			
1992	10530	0			
1993	6968	6000			
1994	4406	4500			
1995	5669	6000			
1996	6245	6500			
1997	6527	6700			
1998	7843	8100			
1999	6621	8100	9291	9800	
2000	6961		7761	8100	
2001	8466		7411	8100	
2002	7997		7964	8100	
2003	8706		8612	10000	***
2004	6529		5946	10000	
2005*	4063		2353	8000	

* Landings to September 21, 2005.

** Fishing year in 1999 was extended to March 31, 2000. TAC prorated upwards. Subsequent fishing years begin on April 1.

*** Quota increased to 10,000t from 8100t during the fishing year.

Table 2. Reported nominal catch (t) of haddock from NAFO Division 4X (Canadian landings include Div. 5Y) by country.

Year	Canada (MQ)	Canada (NFLD)	USA	USSR	Spain	Other	Total	TAC
1970	16050	-	1638	2	370	12	18072	18000
1971	16493	-	654	97	347	1	17592	18000
1972	12593	-	409	10	470	1	13483	9000
1973	12687	-	265	14	134	6	13106	9000
1974	12586	-	660	35	97	-	13378	-
1975	16139	-	2111	39	7	2	18298	15000
1976	16426	-	972	-	95	5	17498	15000
1977	19619	-	1648	2	-	12	21281	15000
1978	26045	114	1135	2	-	27	27323	21500
1979	24837	268	70	3	-	15	25193	26000
1980	28807	71	257	38	-	37	29210	28000
1981	30877	117	466	-	-	15	31475	27850
1982	24843	28	854	-	-	4	25729	32000
1983	26843	44	494	17	-	7	27405	32000
1984	20927	23	206	-	-	-	21156	32000
1985	16105	-	25	-	-	1	16131	15000
1986	15507	-	38	10	-	-	15555	15000
1987	13763	-	17	-	-	-	13780	15000
1988	11217	-	2	53	-	-	11272	12400
1989	6794	-	1	5	-	-	6800	4600
1990	7504	-	32	172	-	32	7556	4600
1991	9772	13	-	382	-	32	9826	-
1992	10508	51	-	-	-	172	10530	-
1993	6947	-	-	-	-	212	6968	6000
1994	4405	-	-	-	-	12	4406	4500
1995	5660	-	-	-	-	92	5669	6000
1996	6237	-	-	-	-	82	6245	6500
1997	6519	-	-	-	-	82	6527	6700
1998	7842	-	-	-	-	12	7843	8100
1999	6621	-	-	-	-	-	6621	8100
2000	6961	-	-	0	-	-	6961	8100
2001	8466	-	-	-	-	-	8466	8100
2002	7997	-	-	-	-	-	7997	8100
2003	8706	-	-	-	-	-	8706	10000
2004	6529	-	-	-	-	-	6529	10000
2005*	4063	-	-	-	-	-	4063	8000

* 2005 data only until September 21, 2005

Table 3. Canadian Atlantic Quota Reports.

Preliminary Final for fishing year 2004/05 for 4X5Y haddock.

	Allocation	Total		Remaining
01/04/04 - 31/03/05 - final				
FIXED < 45'	2,926	872	30%	2,054
FIXED 45' - 64'	166	35	21%	130
MOBILE < 65' (ITQ)	5,382	4,008	74%	1,374
MOBILE < 65' (GENERALISTS)	270	164	61%	106
FIXED 65' - 100' BYCATCH	0	0	-	-
MOBILE 65' - 100' BYCATCH	200	129	65%	71
VESSELS > 100'	397	262	66%	135
ABORIGINAL FISHERY	929	644	69%	285
TOTAL 4X,5Y HADDOCK	10,270	6,115	60%	4,156

Fishing year 2005/06 to Oct. 21/05

	Allocation	Total		Remaining
01/04/05 - 31/03/06 - to Oct. 21/05				
FIXED < 45'	2,341	686	29%	1,655
FIXED 45' - 64'	85	14	17%	71
MOBILE < 65' (ITQ)	4,308	2,172	50%	2,137
MOBILE < 65' (GENERALISTS)	212	49	23%	163
FIXED 65' - 100' BYCATCH	45	0	0%	45
MOBILE 65' - 100' BYCATCH	45	1	1%	44
VESSELS > 100'	388	32	8%	356
ABORIGINAL FISHERY	698	218	31%	480
TOTAL 4X,5Y HADDOCK	8,123	3,172	39%	4,950

Fishing year 2004/05 to Oct. 22/04

	Allocation	Total		Remaining
01/04/04 - 31/03/05 - to Oct. 22/04				
FIXED < 45'	2,926	698	24%	2,228
FIXED 45' - 64'	284	21	7%	263
MOBILE < 65' (ITQ)	5,373	2,153	40%	3,220
MOBILE < 65' (GENERALISTS)	265	159	60%	106
FIXED 65' - 100' BYCATCH	56	0	0%	56
MOBILE 65' - 100' BYCATCH	56	14	25%	42
VESSELS > 100'	485	78	16%	407
ABORIGINAL FISHERY	820	177	22%	643
TOTAL 4X,5Y HADDOCK	10,265	3,301	32%	6,964

Table 4. Reported nominal catch (t) of haddock from NAFO divisions 4X5Y landed in the Maritimes by gear type and tonnage class.

Year	MG[1] 1-3	MG 4+	LL	HL	GN	Misc2	Total
1970[3]	5519	6503	2961	539	88	402	16012
1971	4743	7716	3227	456	79	183	16404
1972	2942	4755	4048	498	59	268	12570
1973	1929	4233	5853	377	143	145	12680
1974	4113	1628	6211	258	166	58	12434
1975	6183	4406	4944	275	176	75	16059
1976	4390	6157	4642	714	389	46	16338
1977	6290	8346	4032	411	337	177	19593
1978	9588	8099	6072	865	573	198	25395
1979	10293	8638	4349	838	399	63	24580
1980	13131	7444	5723	1281	797	228	28604
1981	14912	6649	7008	923	856	17	30365
1982	11960	3122	6763	875	814	31	23565
1983	12988	2560	7787	786	664	56	24841
1984	12081	615	6307	492	183	4	19682
1985	10244	563	4028	336	110	33	15314
1986	9854	209	4875	469	88	13	15507
1987	8177	511	4572	286	215	3	13763
1988	7269	377	3356	126	81	23	11233
1989	3829	90	2469	221	158	27	6794
1990	3329	110	3391	396	278	0	7504
1991	4182	206	4588	539	257	1	9772
1992	3469	258	5587	974	215	5	10508
1993	2632	123	3227	865	100	1	6947
1994	2081	97	1578	600	48	2	4405
1995	3062	106	2171	250	69	2	5660
1996	3685	151	2053	298	50	0	6237
1997	4238	65	2066	110	58	0	6538
1998	5155	80	2461	141	50	0	7887
1999	4475	120	1955	40	31	0	6621
2000	4129	105	2670	29	28	0	6961
2001	6140	88	2227	11	21	0	8486
2002	5630	37	2252	55	23	0	7997
2003	6616	29	2008	26	26	0	8706
2004	5376		1116	15	22	0	6529
2005*	3438	53	558	3	11	0	4063

[1] Mobile gears = Otb1, Otb2, PT, SDN, SS, MWT, MWPT, ShrT, Pair Seine.

[2] Misc. gears = Misc, Trap, UNK, Dredge, Jigger, Pot, Mech sq jig, undef, weir.

[3] Years 1970 to 1985 are from NAFO, and do not include area 5Y landings. From 1986 to 2002, data is from ZIF files; from 2003 to present, data is from MARFIS; data from 1986 includes landings from 5Y.

* 2005 data until September 21, 2005.

Table 5. Reported landings by month and gear type from NAFO divisions 4X5Y (from ZIF and Marfis).

Total	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Jan	789	859	1168	2119	996	1371	1057	1519	361	404	539	396	109	419	531	644	1371	982	809	339	402
Feb	3898	2913	2320	1523	1447	1262	1361	1052	924	280	387	463	614	939	526	1129	603	670	398	613	577
Mar	626	1071	2085	216	836	288	318	366	452	139	518	481	572	1103	252	897	1496	772	1190	1351	741
Apr	1000	481	594	637	371	293	241	228	316	209	230	282	439	650	269	146	343	568	277	244	191
May	1164	1109	1363	808	245	429	542	606	676	278	314	273	194	132	324	325	413	361	569	366	176
Jun	2060	1059	1381	1289	906	597	942	1131	897	692	445	539	395	354	420	383	389	599	323	227	188
Jul	1599	1262	961	876	485	739	1086	1297	909	838	697	659	642	743	716	769	606	902	760	396	428
Aug	1291	1254	777	529	504	640	877	1027	1085	366	570	578	664	654	976	745	840	936	903	616	825
Sep	1585	2652	1458	1697	444	864	978	1127	797	421	572	602	899	1042	1114	788	942	816	1243	854	535
Oct	1096	1613	1057	790	330	408	742	801	267	289	492	699	867	645	587	609	628	578	898	584	
Nov	436	635	347	231	147	309	585	529	195	220	256	707	598	503	495	344	545	428	832	548	
Dec	562	599	253	503	83	305	1042	825	69	268	640	559	544	705	412	182	292	388	503	391	
Total	16105	15507	13763	11217	6794	7504	9772	10508	6947	4405	5660	6237	6538	7887	6621	6961	8466	8000	8705	6529	4063

Mobile	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Jan	331	421	448	1312	614	720	280	578	259	112	246	197	78	319	476	518	1049	780	579	224	371
Feb	2598	1806	1192	1037	1062	794	508	414	232	244	375	450	457	885	494	826	502	598	325	496	569
Mar	439	754	1739	109	667	77	122	225	223	137	518	481	539	1033	229	549	1258	621	1012	1294	724
Apr	792	364	520	555	289	244	159	97	107	155	117	270	399	511	241	123	296	538	252	221	166
May	1067	1021	1207	756	193	379	449	353	396	227	182	203	176	99	296	288	386	347	544	351	164
Jun	1924	900	1142	1185	735	361	589	659	467	195	185	141	249	170	305	217	269	529	257	192	148
Jul	1306	871	549	670	171	315	440	450	320	234	207	267	337	320	349	341	301	541	538	257	293
Aug	856	688	293	117	83	113	195	137	166	141	188	275	277	304	589	316	475	481	560	418	629
Sep	1046	1852	1009	1103	47	154	280	197	209	202	269	364	559	492	733	414	722	432	864	671	426
Oct	713	938	473	469	15	95	235	161	163	160	292	414	502	259	283	282	331	300	607	425	
Nov	240	206	75	89	9	100	319	163	147	121	188	453	420	340	291	226	397	221	688	463	
Dec	290	242	40	248	24	87	811	293	67	252	402	319	311	504	308	133	230	282	420	364	
Total	11602	10062	8687	7648	3909	3439	4388	3727	2755	2178	3168	3836	4303	5235	4595	4234	6216	5670	6646	5376	3491

Longline	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Jan	457	438	718	807	382	645	777	937	102	292	293	199	31	99	55	126	321	201	229	116	31
Feb	1300	1107	1126	485	385	463	851	638	691	36	11	13	157	54	32	302	101	72	73	116	8
Mar	185	316	342	104	168	205	193	140	227	2	0	0	33	71	23	347	237	150	174	51	15
Apr	207	117	66	81	69	48	77	127	205	53	112	12	40	139	27	22	47	30	24	21	24
May	91	84	138	50	47	33	87	243	275	41	126	64	16	32	27	37	27	13	25	14	11
Jun	99	102	180	83	115	107	236	330	223	236	162	260	102	152	102	149	116	62	55	30	37
Jul	159	186	291	177	229	265	444	506	294	352	363	267	254	352	335	411	297	327	210	127	130
Aug	291	429	367	367	357	382	481	570	608	158	372	249	344	316	377	422	355	427	328	193	193
Sep	448	713	361	538	325	555	524	717	471	180	230	215	323	507	372	370	215	379	376	179	108
Oct	357	621	516	288	266	270	427	507	84	116	197	280	357	378	299	319	295	277	288	157	
Nov	190	418	259	128	110	202	262	349	45	98	68	254	178	161	202	118	147	207	143	85	
Dec	271	356	210	254	54	216	229	529	2	16	238	240	232	201	104	49	62	106	83	26	
Total	4056	4888	4575	3362	2506	3391	4589	5592	3228	1580	2173	2053	2066	2461	1955	2670	2219	2252	2008	1116	558

Table 5 continued. Reported landings by month and gear type from NAFO divisions 4X5Y (from ZIF and Marfis).

Handline	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Jan	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apr	0	0	0	0	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
May	4	3	3	0	3	3	2	5	2	9	7	4	1	0	1	0	0	0	0	0	0
Jun	35	50	41	10	43	77	97	132	189	256	91	134	40	22	6	15	3	5	9	2	0
Jul	118	188	88	15	75	93	184	315	284	242	117	113	43	56	25	11	2	25	9	9	2
Aug	101	120	94	32	48	114	138	290	297	61	9	44	21	27	5	2	5	25	7	3	1
Sep	54	72	44	38	31	82	77	143	81	26	23	0	3	34	1	0	0	1	0	2	0
Oct	15	29	10	21	15	20	39	70	9	5	3	2	3	1	1	0	0	0	1	0	
Nov	5	7	2	9	4	4	1	14	2	1	0	0	0	0	0	0	0	0	0	0	
Dec	0	0	3	1	1	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	
Total	334	469	286	126	221	396	539	974	865	600	250	298	110	141	40	29	10	55	26	15	3

Gillnet	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Jan	0	0	2	1	0	6	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0
Feb	0	1	1	1	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	2	0	4	3	0	6	2	0	1	0	0	0	0	0	0	1	0	1	4	6	1
Apr	1	0	7	1	12	0	5	5	2	1	1	0	0	0	0	0	0	1	0	2	1
May	1	1	15	1	2	13	5	5	4	1	0	1	0	0	0	0	0	1	0	1	0
Jun	2	7	17	11	13	51	20	10	18	5	6	4	4	10	6	2	1	3	1	3	2
Jul	16	18	32	14	10	66	18	26	11	10	10	12	8	16	6	6	5	9	3	3	3
Aug	43	16	24	14	15	31	63	29	14	7	2	9	23	7	5	5	5	3	8	2	2
Sep	36	15	44	18	41	72	98	69	36	13	49	22	15	9	7	4	5	4	4	2	1
Oct	10	25	58	13	35	23	41	64	12	9	1	2	6	6	4	8	2	0	3	1	
Nov	0	3	12	4	25	4	2	3	1	1	0	0	0	1	2	0	0	0	1	0	
Dec	1	2	0	1	4	0	1	0	0	0	0	0	1	1		0	0	0	0	1	
Total	113	88	215	82	158	278	257	215	100	48	69	50	58	50	31	28	21	23	26	22	11

* = 2005 data only until September 21, 2005.

Table 6. Reported landings by unit area and gear type from NAFO divisions 4X5Y (from ZIF and MARFIS).

Total	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4XL	0	1	10	0	0	0	0	0	0	0	0	0	1	7	0.43	0	0	0	2	3	1
4XM	699	1203	814	673	432	396	515	259	144	58	95	89	90	142	180	224	228	208	124	45	29
4XN	1941	2055	2481	1412	952	698	1349	1402	1642	365	900	1103	1025	2539	1147	2060	2720	1930	1470	1565	1423
4XO	3861	3732	3183	1656	1557	2292	3264	3898	2316	1618	1052	1158	746	877	848	856	667	783	550	240	131
4XP	1928	1023	1297	1212	1324	1108	1452	749	788	298	1473	1127	1477	1696	2120	1791	2179	1915	2516	2164	1297
4XQ	1974	2280	1283	597	599	999	1292	1104	1124	1088	1139	1097	931	943	976	998	1022	691	620	535	312
4XR	1426	982	249	131	228	259	816	862	533	364	493	870	1154	1035	733	512	792	1271	1446	448	165
4XS	295	212	84	46	15	14	91	60	112	113	164	427	638	412	522	396	735	1062	1766	1319	647
4XU	3191	3794	4271	5358	1593	1729	975	2166	276	487	316	274	431	132	51.3	91.6	72.3	79	126	135	30
5Y	791	225	90	132	92	9	12	8	13	15	28	92	25	60	41.7	31.7	51.3	55	85	74	28
Total	16105	15507	13763	11217	6794	7504	9766	10508	6947	4405	5660	6237	6518	7843	6621	6961	8466	7994	8706	6529	4063

Mobile	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4XL	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
4XM	144	295	132	269	41	35	16	32	7	3	7	10	11	25	21	16	22	6	3	1	8
4XN	1455	1624	2194	1007	733	468	786	939	503	187	222	541	407	1954	825	1157	1790	1150	849	1206	1295
4XO	1949	1329	1059	728	454	533	851	735	500	445	275	214	173	108	143	93	181	231	94	102	47
4XP	1401	538	901	963	1047	738	645	427	355	104	1018	758	1063	867	1402	1141	1702	1324	1885	1771	1054
4XQ	1930	2254	1221	559	566	886	1153	912	925	999	975	995	860	803	932	941	980	605	573	482	267
4XR	1330	910	210	107	207	223	739	604	296	311	477	800	1121	1013	709	468	762	1235	1412	427	159
4XS	277	198	63	22	12	5	87	51	108	112	157	413	627	404	516	387	727	1057	1745	1309	632
4XU	2326	2690	2823	3896	761	543	93	21	50	2	8	14	14	4	6	0	2	5	2	8	1
5Y	791	224	83	97	89	7	11	6	12	14	28	92	25	56	41	30	50	54	81	70	28
Total	11602	10062	8687	7648	3909	3439	4382	3727	2755	2178	3168	3836	4303	5234	4595	4234	6216	5667	6646	5376	3491

Longline	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4XL	0	0	10	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	2	3	1
4XM	493	356	552	359	256	275	409	133	113	50	82	68	73	109	150	202	199	199	120	44	21
4XN	485	432	286	403	219	229	561	458	1129	175	672	556	616	583	321	903	930	779	620	359	128
4XO	1545	1924	1798	791	861	1309	1809	2276	994	663	616	678	490	652	678	752	478	506	440	134	82
4XP	528	486	391	247	277	368	801	319	400	171	435	351	380	805	708	636	474	583	621	382	239
4XQ	33	11	54	30	28	30	97	98	178	10	149	84	61	124	31	44	35	73	40	47	40
4XR	86	61	33	18	9	3	45	181	202	39	13	66	30	20	22	40	29	35	33	20	6
4XS	6	6	2	21	1	8	1	2	1	0	3	6	8	6	2	3	5	3	14	6	14
4XU	858	1100	1445	1446	814	1168	863	2119	211	470	200	243	391	112	43	89	70	71	117	117	28
5Y	0	0	2	35	4	1	0	1	0	0	0	0	0	3	1	1	1	1	1	3	0
Total	4034	4875	4572	3350	2469	3391	4588	5587	3227	1578	2171	2053	2049	2421	1955	2670	2219	2250	2008	1116	558

Table 6 continued. Reported landings by unit area and gear type from NAFO divisions 4X5Y (from ZIF and MARFIS).

Handline	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4XL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4XM	23	17	33	5	4	3	11	13	3	1	0	2	1	1	1	1	0	0	0	0	0
4XN	0	0	0	0	0	0	0	0	7	2	2	5	1	1	1	0	0	1	0	0	0
4XO	294	426	236	111	193	376	460	844	775	486	140	248	72	111	25	9	7	45	15	4	1
4XP	0	0	4	0	0	0	0	1	27	21	13	13	5	2	1	5	1	1	2	2	0
4XQ	11	15	8	2	4	8	30	40	14	75	3	14	6	8	8	9	1	5	2	0	0
4XR	6	10	4	4	12	3	29	74	32	11	0	3	2	0	2	3	0	0	0	0	0
4XS	0	1	1	2	0	0	0	0	3	0	0	1	0	0	0	0	0	0	1	0	0
4XU	0	0	0	3	8	6	9	2	3	4	91	13	23	14	1	2	0	2	5	9	1
5Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	334	469	286	126	221	396	539	974	865	600	250	298	109	137	40	29	10	54	26	15	3

Gillnet	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4XL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4XM	29	31	95	40	96	82	79	79	21	4	5	10	5	7	7	5	7	3	0	0	0
4XN	0	0	0	2	0	1	2	5	3	0	4	1	0	1	0	0	0	0	0	0	0
4XO	67	47	90	26	47	74	144	42	46	21	20	17	12	6	3	1	1	1	1	0	1
4XP	0	0	2	3	0	3	5	1	6	3	7	6	29	22	9	10	2	7	8	9	4
4XQ	0	0	0	0	2	75	12	53	8	4	11	4	4	8	5	4	6	8	5	7	4
4XR	1	1	1	2	0	31	2	3	3	3	3	1	1	2	1	1	1	1	1	1	0
4XS	12	7	18	1	2	1	3	7	1	0	3	7	2	2	4	6	3	2	5	4	1
4XU	4	1	3	8	10	11	10	23	12	11	16	3	4	2	1	0	1	1	2	1	0
5Y	0	1	6	0	0	0	0	1	1	1	0	0	1	1	1	0	0	0	4	0	0
Total	113	88	215	81	158	278	257	215	100	48	69	50	57	51	31	28	21	23	26	22	11

Table 7a. Number of fishing vessels reporting cod, haddock, pollock, or white hake landings, annually.

Year	Otter Trawl	Gill Net	Longline	Handline
1996	142	205	528	779
1997	142	197	497	657
1998	129	163	398	422
1999	129	126	357	354
2000	121	101	376	326
2001	112	97	366	201
2002	113	110	381	162
2003	108	103	339	92
2004	103	98	312	59
2005*	88	88	262	37

Table 7b. Fishing days by gear type.

Year	Gill Net	Longline	Handline
1996	4,912	5,210	9,880
1997	6,281	6,179	9,650
1998	4,178	5,352	5,721
1999	3,370	4,156	4,234
2000	2,321	3,794	3,287
2001	2,116	3,895	2,093
2002	2,253	4,232	1,390
2003	2,432	3,960	711
2004	2,237	3,089	468
2005*	1,909	2,122	243

* 2005 effort to October 4, 2005.

04-Oct-04	2,060	2,615	430

Table 8a. NAFO divisions 4X5Y groundfish landings (t) for mobile gear by fishing year.

	MG < 65'						MG 65' +					
Species	1992	1997	02/03	03/04	04/05	05/06*	1992	1997	02/03	03/04	04/05	05/06*
AMERICAN PLAICE	411	139	56	58	47	26	2	2	0	0	0	
CATFISH	330	460	123	93	82	61	4	1	0	0	0	
COD	10442	4684	2325	2434	2246	946	875	172	95	62	9	2
CUSK	14	22	36	27	30	13	16	1	0	0	0	
DOGFISH	1	9	6	3	1	3	0	0	0	0		
FLOUNDER, UNSPEC	3661	521	144	152	177	168	11	0	0	0	0	
GRENADIER			0	0				65	0	0		
GREYSOLE/WITCH	678	362	350	260	296	169	9	3	13	6	1	0
GROUNDFISH, UNSPEC	37	14	6	2	3	1	1	98	0	0		
HADDOCK	3338	4229	5415	6652	4960	2412	257	65	114	92	66	0
HALIBUT	84	31	31	58	47	37	3	1	0	1	0	0
LUMPFISH			0	0	0	0			0	0		
MONKFISH	144	738	887	986	937	285	19	8	54	44	7	0
POLLOCK	9921	5004	3358	4671	4340	1522	3670	1317	542	460	364	132
RED HAKE		1	30	10	14	7	93	44	18	1	0	
REDFISH	587	5254	4002	2790	2297	2412	1554	179	78	8	1	7
SCULPIN	39	16	134	117	100	171			0	0		
SILVER HAKE		208	2904	681	1100	461	5065	3467	16	0	0	
SKATE	0	45	3	3	35	3	11		0	0		
SUMMER FLOUNDER			0	0					0	0		
TILEFISH	0	0	0	0	0				0	0		
TURBOT		0	0	2	4	1	1	5	0	0		
WHITE HAKE	849	416	519	485	478	221	7	11	6	11	1	0
WINTER FLOUNDER	558	773	643	804	871	582	5	0	0	1	0	
YELLOWTAIL	107	26	18	14	26	11	1	1	0	0		
Grand Total	31200	22951	20992	20304	18090	9511	11603	5441	935	687	450	141

* To October 29, 2005.

Table 8b. NAFO divisions 4X5Y groundfish (t) for fixed gear by fishing year.

Species	Longline						Handline						Gillnet					
	1992	1997	02/03	03/04	04/05	05/06*	1992	1997	02/03	03/04	04/05	05/06*	1992	1997	02/03	03/04	04/05	05/06*
AMERICAN PLAICE		0	1	1	1	0								0	0	0	0	0
CATFISH	89	63	32	42	32	27	20	9	2	1	4	0	4	1	0	0	0	0
COD	8737	3582	1972	1849	1199	877	3518	1826	292	154	125	37	2398	1271	1104	1009	1158	707
CUSK	3400	1401	827	675	552	590	63	11	3	4	2	2	74	22	12	12	7	5
DOGFISH	124	123	1873	393	1000	803	392	1	940	474	1003	567		107	365	291	329	280
FLOUNDER, UNSPEC	21	4	0	1	0	0	123	0	0	0	0	0	110	29	17	10	11	12
GRENADIER					0													
GREYSOLE/WITCH	0	0	0	0	0								0	0		0	0	
GROUNDFISH, UNSPEC	205	1	1	0	0	0	21	2		0	0	0	2	0	1	0	1	0
HADDOCK	5587	2066	2322	1821	906	659	974	110	56	26	15	3	215	58	24	26	18	11
HALIBUT	252	293	267	291	299	257	12	5	3	3	2	2	4	2	1	1	1	1
LUMPFISH			0		0									0	0		0	0
MONKFISH	109	101	92	63	19	24	4	1	0	0	0	0	34	49	26	25	27	29
POLLOCK	790	229	101	73	28	47	1777	760	117	129	82	71	4959	2406	1492	1705	1867	1217
REDFISH	14	23	21	16	10	6	0	0	0	0	0	0	7	14	4	7	6	4
SCULPIN			1	0	0	0								3	9	9	6	4
SILVER HAKE	1	2		0	0	0								0		1	20	5
SKATE	1	21	14	18	9	17		0					0	0	0	0	0	0
TILEFISH	16	6	4	0	0	1	0	0					0	0		0	0	0
TURBOT	3	2	1	1	1	3								0	0	0	0	
WHITE HAKE	1861	904	591	509	520	408	68	11	5	2	6	0	655	1349	918	723	633	623
WINTER FLOUNDER		0	0	0	0	0	0						0	1	0	0	0	1
YELLOWTAIL	8	6	1	1	0	0	1	0		0	0		0	0	0	0	0	0
Grand Total	21219	8828	8119	5756	4577	3720	6974	2738	1419	792	1239	682	8461	5313	3974	3821	4084	2900

* To October 29, 2005.

Table 9a. Sampling data that went into the generation of the commercial catch-at-age in NAFO divisions 4X5Y haddock in 2004.

Area	Gear	Quarter	Tonnage	# measured	# Aged	ALK used	Comments; Work file =c:\haddock\assessment 2005\awf2004
4Xmnop	Mobile gear	1	1759	2965	336	H1mnopMob	Alk made up from 1st half year.
4Xmnop	Mobile gear	2	252	520	28	H1mnopMob	Alk made up from 1st half year.
4Xmnop	Mobile gear	3	498	940	86	H2mnopMob	Alk made up from 2nd half year.
4Xmnop	Mobile gear	4	573	1952	189	H2mnopMob	Alk made up from 2nd half year.
4Xqrs5Y	Mobile gear	1	255	612	85	H1qrsyMob	Alk made up from 1st half year.
4Xqrs5Y	Mobile gear	2	512	1957	208	H1qrsyMob	Alk made up from 1st half year.
4Xqrs5Y	Mobile gear	3	848	3019	133	H2qrsyMob	Alk made up from 2nd half year.
4Xqrs5Y	Mobile gear	4	679	1428	91	H2qrsyMob	Alk made up from 2nd half year.
4Xmnop	Fixed gear	1	283	917	84	mnopFixed	includes LL/Hl and Miscellaneous, Alk for entire year.
4Xmnop	Fixed gear	2	43	550	34	mnopFixed	includes LL/Hl and Miscellaneous, Alk for entire year.
4Xmnop	Fixed gear	3	464	1257	96	mnopFixed	includes LL/Hl and Miscellaneous, Alk for entire year.
4Xmnop	Fixed gear	4	263	755	54	mnopFixed	includes LL/Hl and Miscellaneous, Alk for entire year.
4Xqrs5Y	Fixed gear	1	6			H1qrsy	applied Lf form 4Xqrs5YFix from Q2 to tonnage from this quarter.
4Xqrs5Y	Fixed gear	2	30	540	33	H1qrsy	Alk made up from all gears 4Xqrs5Y, 1st half of year
4Xqrs5Y	Fixed gear	3	56	460	23	H2qrsy	Alk made up from all gears 4Xqrs5Y, 2nd half of year
4Xqrs5Y	Fixed gear	4	8	144	22	H2qrsy	Alk made up from all gears 4Xqrs5Y, 2nd half of year

Table 9b. Sampling data that went into the generation of the commercial catch-at-age in NAFO divisions 4X5Y haddock in 2005.

Area	Gear	Quarter	Tonnage	# measured	# Aged	ALK used	Comments; Work file =c:\haddock\assessment 2005\awf2005
4Xmnop	Mobile gear	1	1533	760	104	4Xmnop	Alk made up from 1st half year, all gears.
4Xmnop	Mobile gear	2	164	485	92	4Xmnop	Alk made up from 1st half year, all gears.
4Xqrs5Y	Mobile gear	1	131	719	79	4Xqrs5Y	Alk made up from 1st half year, all gears.
4Xqrs5Y	Mobile gear	2	315	1001	118	4Xqrs5Y	Alk made up from 1st half year, all gears.
4Xmnop	Fixed gear	1	53			4Xmnop	Alk made up from 1st half year, all gears, applied LF from Q2.
4Xmnop	Fixed gear	2	48	263	25	4Xmnop	Alk made up from 1st half year, all gears.
4Xqrs5Y	Fixed gear	1	2			4Xqrs5Y	Alk made up from 1st half year, all gears, applied LF from Q2.
4Xqrs5Y	Fixed gear	2	28	927	31	4Xqrs5Y	Alk made up from 1st half year, all gears.

Table 10. NAFO divisions 4X5Y haddock commercial catch-at-age (000s).

using seasonal a's and b's

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	0	3	8	22	10	3	0	0	0	0	0	0	1	0	0
2	403	52	141	139	98	99	37	13	31	28	227	95	41	26	9
3	1422	1304	243	709	368	757	809	526	149	472	409	1587	375	620	149
4	394	2351	2523	520	632	694	993	1676	1052	511	761	1013	2294	1435	353
5	358	580	2290	1828	327	617	682	1008	1795	1219	520	750	652	2649	689
6	472	246	229	1070	971	238	428	455	1137	941	1208	622	515	603	969
7	391	310	247	170	269	449	355	269	536	581	924	1278	467	329	288
8	654	200	331	106	24	421	439	138	329	221	524	889	689	266	124
9	277	310	237	73	17	162	355	110	181	54	210	366	484	214	104
10	204	280	240	46	13	24	130	94	192	48	104	120	226	154	88
11	61	142	132	58	20	26	17	35	140	53	37	24	104	49	26
12	48	169	152	51	15	18	1	4	31	25	8	16	55	20	10
13	9	71	36	12	7	11	3	2	6	5	11	4	15	10	9
14	9	13	15	7	1	11	1	0	8	0	6	15	2	0	2
15	2	4	2	1	0	3	1	0	5	0	5	0	2	0	0
16	1	4	2	0	1	2	2	1	1	0	0	0	1	0	0
sum	4705	6039	6828	4812	2773	3535	4253	4331	5593	4160	4953	6780	5921	6375	2820

using annual a's and b's

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	0	3	8	29	24	3	0	0	0	0	0	0	1	0	0
2	313	18	164	139	113	92	24	15	39	38	257	100	46	28	10
3	1189	1163	224	567	404	830	912	340	109	462	448	1654	415	673	161
4	370	2553	2589	495	564	667	1088	1807	947	563	819	1053	2520	1551	376
5	461	585	2272	1790	312	738	638	1012	1804	1237	558	776	713	2870	732
6	459	261	276	1199	974	192	514	478	1188	941	1289	646	563	651	1026
7	512	340	238	205	306	438	397	269	576	598	980	1326	511	353	303
8	628	248	250	111	34	471	523	140	410	230	556	923	752	286	130
9	299	305	153	139	14	195	478	192	141	55	224	379	529	230	108
10	211	260	300	45	14	40	138	133	220	49	111	124	248	167	93
11	55	168	90	53	23	27	18	54	114	54	39	25	114	52	27

using annual a's and b's

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
12	50	146	126	41	11	19	1	41	27	25	9	16	61	22	11
13	14	55	34	17	4	7	1	3	5	5	11	4	16	11	10
14	9	9	18	11	1	11	3	1	11	0	6	15	3	0	2
15	5	6	4	1	0	5	1	0	7	0	5	0	2	0	0
16	3	7	1	0	2	2	4	7	3	0	0	0	1	0	0
sum	4577	6127	6748	4843	2799	3737	4740	4489	5600	4258	5313	7044	6494	6894	2989

% difference

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	0	6	-4	-33	-140	-5	0	0	0	0	0	0	-11	0	0
2	22	65	-16	0	-16	7	36	-13	-24	-34	-13	-5	-11	-9	-9
3	16	11	8	20	-10	-10	-13	35	27	2	-10	-4	-11	-9	-8
4	6	-9	-3	5	11	4	-10	-8	10	-10	-8	-4	-10	-8	-6
5	-29	-1	1	2	5	-20	6	0	-1	-1	-7	-4	-9	-8	-6
6	3	-6	-20	-12	0	19	-20	-5	-4	0	-7	-4	-9	-8	-6
7	-31	-10	4	-20	-14	3	-12	0	-7	-3	-6	-4	-9	-7	-5
8	4	-24	24	-5	-40	-12	-19	-1	-25	-4	-6	-4	-9	-7	-5
9	-8	2	35	-90	16	-20	-35	-74	22	-2	-7	-4	-9	-7	-5
10	-3	7	-25	2	-8	-68	-6	-42	-15	-1	-6	-4	-10	-8	-5
11	10	-19	32	9	-16	-5	-6	-54	19	-1	-6	-4	-10	-7	-4
12	-4	13	17	19	29	-4	15	-914	13	-1	-7	-4	-10	-9	-5
13	-58	23	5	-38	50	35	64	-75	21	-1	-6	-4	-10	-11	-4
14	-5	28	-18	-62	-15	3	-166	0	-41	13	-7	-4	-11	0	-3
15	-129	-55	-85	-8		-62	11	0	-33	-1	-8	-5	-11	0	0
16	-157	-72	45	0	-51	-4	-101	-605	-213	0	0	0	-11	0	0
sum	3	-1	1	-1	-1	-6	-11	-4	0	-2	-7	-4	-10	-8	-6

Table 11. NAFO divisions 4X5Y haddock commercial catch-at-age (000's).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	0	0	42	152	1	37	18	2	0	0	16	1	0	0	2	0	0	0
2	1088	809	22	3114	713	2198	1306	1289	77	83	164	1210	526	70	763	228	294	90
3	747	1660	3490	114	4783	4617	1657	3137	3453	1184	2497	2268	3895	3621	1195	2105	1153	1043
4	1549	809	1871	2274	318	5220	4295	2026	7221	6862	3071	6369	2648	6020	5046	2455	4871	3030
5	391	1460	517	1080	1829	490	3712	3204	2156	3970	5527	4300	4954	4104	3708	4658	4021	4588
6	541	415	656	533	523	1115	437	2891	2916	1094	3573	3272	1823	2454	2583	1508	1512	2096
7	4679	71	91	607	194	250	813	361	1071	1272	538	1191	1560	1033	1022	509	226	291
8	1922	3404	58	326	277	174	155	390	141	269	636	366	364	434	367	136	98	58
9	137	1047	1185	262	191	63	72	107	110	58	173	331	196	206	119	51	36	7
10	99	167	520	621	277	32	96	72	27	70	35	99	101	131	83	16	31	9
11	181	186	26	56	567	167	39	23	9	11	21	14	48	76	39	7	11	6
12	28	150	196	13	25	231	104	8	6	1	3	24	17	27	22	4	6	0
13	38	108	93	6	4	11	158	87	49	18	10	9	15	27	13	2	3	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	half-2005*
1	13	13	0	3	8	29	24	3	0	0	0	0	0	0	1	0	0	0
2	214	190	313	18	164	139	113	92	24	15	39	38	257	100	46	28	14	2
3	512	497	1189	1163	224	567	404	830	912	340	109	462	448	1654	415	673	262	29
4	1016	499	370	2553	2589	495	564	667	1088	1807	947	563	819	1053	2520	1551	972	240
5	896	936	461	585	2272	1790	312	738	638	1012	1804	1237	558	776	713	2870	1172	615
6	1968	310	459	261	276	1199	974	192	514	478	1188	941	1289	646	563	651	1819	577
7	871	720	512	340	238	205	306	438	397	269	576	598	980	1326	511	353	586	449
8	894	460	628	248	250	111	34	471	523	140	410	230	556	923	752	286	283	151
9	372	504	299	305	153	139	14	195	478	192	141	55	224	379	529	230	227	68
10	209	255	211	260	300	45	14	40	138	133	220	49	111	124	248	167	164	48
11	146	57	55	168	90	53	23	27	18	54	114	54	39	25	114	52	62	50
12	49	81	50	146	126	41	11	19	1	41	27	25	9	16	61	22	43	20
13	44	30	14	55	34	17	4	7	1	3	5	5	11	4	16	11	19	0
14	22	12	9	9	18	11	1	11	3	1	11	0	6	15	3	0	4	0
15	7	4	5	6	4	1	0	5	1	0	7	0	5	0	2	0	0	0
16	4	0	3	7	1	0	2	2	4	7	3	0	0	0	1	0	0	0

Table 12. NAFO divisions 4X5Y haddock comparison of age composition (%) of projected and actual catch-at-age.

	2003 projected	actual
1	0	0
2	0	0
3	7	10
4	25	23
5	29	42
6	9	10
7	8	5
8	5	4
9	12	3
10	3	2
	100	100

	2004 projected	actual
1	0	0
2	0	0
3	3	5
4	17	13
5	22	25
6	19	34
7	10	10
8	7	4
9	4	4
10	7	3
	100	100

	2005 projected	half year 2005 actual
1	0	0
2	0	0
3	4	1
4	7	11
5	16	28
6	23	27
7	32	21
8	9	7
9	6	3
10	3	2
	100	100

Table 13. NAFO divisions 4X5Y Haddock commercial weight-at-age (kg).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	0.29	0.29	0.29	0.27	0.18	0.23	0.23	0.28	0.29	0.29	0.16	0.23			0.25			
2	0.57	0.5	0.45	0.51	0.46	0.52	0.52	0.46	0.44	0.51	0.522	0.593	0.493	0.394	0.527	0.573	0.522	0.615
3	0.9	0.96	0.9	0.75	0.82	0.82	0.81	0.71	0.87	0.87	0.882	0.877	0.907	0.758	0.785	0.83	0.728	0.779
4	1.05	1.25	1.35	1.25	1.1	1.2	1.19	1.22	1.33	1.33	1.326	1.26	1.294	1.141	1.069	1.071	1.022	1.005
5	1.16	1.4	1.6	1.8	1.7	1.55	1.6	1.72	1.85	1.84	1.777	1.721	1.653	1.714	1.411	1.408	1.38	1.328
6	1.43	1.5	1.75	2	2.3	2.25	2.1	2.2	2.33	2.36	2.355	2.219	2.13	2.146	1.932	1.966	1.838	1.796
7	1.65	1.75	1.9	2.2	2.5	2.85	2.95	2.94	2.7	2.83	2.906	2.654	2.577	2.607	2.287	2.442	2.506	2.472
8	1.95	1.95	2.1	2.3	2.6	3	3.5	3.3	3.39	3.3	3.278	3.134	2.947	2.869	2.683	2.92	2.775	3.123
9	2.3	2.3	2.3	2.5	2.8	3.2	3.6	3.57	3.77	4.03	3.811	3.608	3.47	3.108	3.054	3.501	3.396	4.061
10	2.82	2.65	2.8	2.7	2.95	3.45	3.8	3.77	4.17	4.15	4.332	3.688	4.033	3.55	3.431	3.313	3.493	3.309
11	2.8	3.25	3	3.3	3.2	3.5	4.1	3.69	4.03	4.96	4.2	4.546	3.946	3.63	3.841	4.029	3.299	4.15
12	2.85	3	3.7	3.4	3.8	3.7	4	3.94	3.62	6	4.963	4.823	4.033	3.78	4.114	4.424	3.331	4.775
13	3.6	3	3.3	4.2	3.9	4.4	4.2	3.91	4.63	5.68	5.711	4.68	4.908	4.064	4	5.468	4.286	5.173
14																5.595	4.804	5.827
15																		
16																		7.526

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	*half year 2005*	mean 1970-04
1	0.439			0.55	0.671			0.161							0.284				0.196
2	0.848	0.81	0.666	1.159	0.79	0.796	0.872	0.773	0.906	0.827	0.611	0.965	0.798	0.752	0.824	0.917	0.458	0.255	0.609
3	1.085	1.085	1.073	1.104	1.026	0.972	1.139	1.074	1.011	1.03	0.922	1.176	0.947	1.001	1.046	1.076	0.814	0.610	0.914
4	1.179	1.232	1.431	1.44	1.232	1.129	1.312	1.369	1.217	1.289	1.029	1.436	1.193	1.096	1.225	1.199	0.964	0.663	1.194
5	1.469	1.35	1.809	1.833	1.572	1.392	1.483	1.597	1.396	1.561	1.23	1.407	1.274	1.217	1.317	1.422	0.971	0.809	1.496
6	1.522	1.511	1.74	2.016	1.956	1.734	1.793	1.73	1.598	1.869	1.429	1.620	1.320	1.216	1.328	1.427	1.224	0.916	1.796
7	1.683	1.69	2.001	2.088	1.887	2.132	2.08	1.976	1.614	2.048	1.676	1.966	1.532	1.318	1.367	1.443	1.340	1.129	2.089
8	1.794	1.672	2.05	2.234	1.963	2.098	2.493	2.013	1.86	2.069	1.88	2.198	1.776	1.502	1.399	1.493	1.461	1.133	2.345
9	2.031	1.815	2.108	2.24	2.158	2.365	2.101	2.355	2.136	2.199	2.08	2.100	2.201	1.696	1.601	1.473	1.369	1.470	2.601
10	2.256	1.882	2.351	2.228	2.167	2.242	2.775	2.286	2.042	2.357	2.122	2.154	2.450	2.094	1.852	1.822	1.585	1.595	2.809
11	2.373	2.256	2.316	2.274	2.1	2.377	2.204	2.584	2.75	2.648	2.433	2.678	2.090	2.410	2.074	2.278	1.850	1.472	3.003
12	2.57	2.379	2.613	2.339	1.968	2.148	2.381	2.305	3.373	2.55	2.939	2.490	3.405	2.484	1.828	2.486	1.743	1.554	3.25
13	2.329	2.49	2.373	2.327	2.66	2.521	2.899	2.623	3.027	3.072	3.537	2.141	2.525	2.579	3.177	2.576	2.006	2.695	3.524
14	3.302	2.713	3.126	2.654	2.919	2.887	4.51	2.902	3.271	4.481	3.604	5.700	3.477	1.788	4.459		2.916	4.017	3.619
15	3.767	3.135	3.204	3.421	3.218	4.777	4.308	3.095	3.49		2.348	5.184	2.645	3.167	4.737				3.69
16	4.754	6.052	4.546	3.787	5.541	5.628	2.486	3.224	3.286	3.674	3.081				5.560				5.821

Table 14. NAFO divisions 4X5Y haddock observer coverage.

2004 Observer Summary

	# trips	>1t	>.5t	t
Otter trawl	56	36	41	166
Longline	19	13	14	40
gillnet	6	0	0	0.5
	81			207

2005 Observer Summary

	# trips	>1t	>.5t	t
Otter trawl	28	13	16	55
Longline	9	2	6	6
gillnet	7	0	0	0.4
	44			62

Table 15. NAFO divisions 4X5Y haddock summer research vessel survey trends - stratified mean catch.

#/tow	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
470-481	33.23	48.42	24.94	56.33	107.20	42.24	37.20	259.73	49.33	46.84	95.82	59.54	80.09	49.49	63.65	103.70	83.72	28.12
482-495	12.85	9.58	3.35	11.75	29.21	7.55	17.16	26.51	13.19	39.61	37.16	105.72	58.54	23.75	63.96	27.95	12.30	8.55
Total	22.98	28.90	14.09	33.91	67.99	24.80	27.12	142.49	31.16	43.20	66.34	82.75	69.26	36.55	63.81	65.62	47.82	18.28

#/tow	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-2004
470-481	26.89	32.96	31.14	42.94	28.36	17.11	36.53	105.60	81.94	69.99	65.11	191.56	152.85	212.82	120.28	79.34	67.80	79.91	75.22
482-495	14.58	11.05	21.37	24.83	11.77	4.17	32.06	60.91	67.92	33.60	26.38	30.88	69.70	36.04	39.77	35.54	22.46	16.88	30.05
Total	20.70	21.95	26.23	33.83	20.02	10.61	34.28	83.14	74.89	51.70	45.64	110.78	111.05	123.95	79.80	57.32	45.00	48.24	52.51

kg/tow	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
470-481	11.77	20.69	10.92	8.38	24.71	16.61	13.32	106.32	19.18	20.61	37.17	19.07	13.11	15.23	17.35	29.64	25.21	11.67
482-495	11.41	8.93	4.06	6.25	12.07	5.69	9.40	19.62	10.66	28.36	23.55	29.14	39.51	13.53	24.16	15.63	8.90	5.44
Total	25.16	32.05	15.39	20.10	43.19	23.72	24.11	140.65	31.70	50.81	63.09	49.26	55.42	29.28	42.56	47.28	36.51	17.44

kg/tow	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-2004
470-481	8.80	5.60	9.06	16.67	10.69	4.13	5.25	8.05	12.08	14.81	10.75	19.37	10.18	30.44	25.59	18.51	16.82	18.58	18.51
482-495	8.45	5.34	14.90	20.24	10.62	3.13	7.60	17.93	35.80	12.07	14.70	9.79	20.02	13.71	14.05	21.53	7.68	6.74	14.68
Total	17.77	13.27	25.79	37.58	22.05	7.92	14.98	30.91	51.36	28.22	27.08	35.35	37.82	52.25	41.79	40.90	25.21	27.59	35.94

4+ kg/tow	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
470-481	10.95	18.35	9.10	8.13	11.84	13.63	11.83	61.72	12.63	18.94	32.36	17.91	10.46	11.97	15.72	24.04	22.61	10.47
482-495	11.23	7.85	3.86	5.03	2.91	4.61	7.05	13.99	6.89	21.62	15.46	13.38	30.73	9.00	15.22	8.49	7.22	4.96
Total	22.18	26.20	12.97	13.15	14.75	18.24	18.88	75.70	19.52	40.56	47.82	31.29	41.19	20.97	30.93	32.52	29.83	15.43
%SS	49	70	70	62	80	75	63	82	65	47	68	57	25	57	51	74	76	68	

4+ kg/tow	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-2004
470-481	8.34	5.01	4.82	11.75	10.16	3.50	4.54	5.50	7.82	9.53	9.28	16.33	8.63	16.98	20.19	14.49	15.26	17.68	14.23
482-495	7.22	3.34	9.86	15.23	10.43	2.45	3.79	6.06	22.77	8.20	13.65	7.25	6.99	5.91	9.87	20.64	6.48	5.25	9.86
Total	15.55	8.35	14.69	26.98	20.58	5.95	8.33	11.56	30.59	17.73	22.93	23.58	15.63	22.88	30.06	35.14	21.74	22.93	24.09
%SS	54	60	33	44	49	59	54	48	26	54	40	69	55	74	67	41	70	77	59

Table 16. NAFO divisions 4X5Y haddock mean numbers-at-age per standard tow from the 1970-2005 summer research vessel survey.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.47	0.03	0.54	0.14	0.32	0.27	0.00	0.14	0.00
1	5.21	0.10	4.72	5.79	10.31	6.02	4.98	5.77	5.54	1.84	19.84	32.96	11.70	6.11	3.75	6.31	3.44	1.20
2	4.17	10.08	0.21	20.57	20.71	3.24	5.86	36.36	4.73	12.40	6.32	25.43	25.10	4.04	21.44	8.68	8.54	1.38
3	1.23	4.38	3.04	0.66	29.86	4.83	3.77	56.66	10.95	7.46	13.92	6.15	11.91	12.89	10.99	20.81	6.75	2.45
4	2.31	1.94	1.38	2.89	0.91	7.17	3.94	16.13	3.74	9.45	7.16	8.43	4.73	5.70	16.56	9.54	13.55	3.03
5	0.93	2.70	0.81	1.36	3.74	0.37	6.65	15.62	1.55	4.78	11.12	3.43	7.69	3.36	5.20	13.15	5.30	3.67
6	2.14	1.28	0.90	0.48	0.84	1.62	0.58	8.61	2.98	2.00	4.29	3.80	3.14	2.12	2.66	3.38	5.66	2.55
7	5.51	1.99	0.59	0.70	0.49	0.41	0.72	1.17	1.18	2.99	1.55	1.21	3.43	0.87	1.28	1.68	2.02	1.86
8	0.78	5.49	0.92	0.52	0.59	0.31	0.13	1.41	0.08	1.29	1.17	0.16	0.59	0.31	0.54	1.06	1.04	0.81
9	0.31	0.71	1.44	0.34	0.32	0.13	0.07	0.16	0.00	0.22	0.59	0.30	0.38	0.29	0.36	0.59	0.59	0.24
10	0.30	0.08	0.05	0.57	0.23	0.11	0.02	0.14	0.00	0.10	0.23	0.18	0.21	0.21	0.08	0.22	0.34	0.29
11	0.07	0.04	0.01	0.02	0.35	0.34	0.01	0.02	0.04	0.00	0.03	0.08	0.14	0.17	0.03	0.06	0.06	0.07
12	0.02	0.10	0.00	0.00	0.00	0.26	0.14	0.15	0.03	0.00	0.00	0.04	0.00	0.05	0.03	0.03	0.10	0.01
13	0.00	0.00	0.01	0.01	0.00	0.00	0.10	0.08	0.02	0.00	0.00	0.00	0.00	0.05	0.04	0.03	0.06	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.09	0.06	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.03
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unknown	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.01	0.18	0.03	0.06	0.05	0.11	0.05	0.03	0.03	0.10	0.70
4X total	22.98	28.89	14.09	33.91	68.35	24.80	27.12	142.59	31.16	43.21	66.31	82.76	69.27	36.54	63.25	65.60	47.69	18.28
SS total	33.23	48.43	24.94	56.32	107.20	42.24	37.20	259.73	49.33	46.83	95.83	59.54	80.09	49.49	62.54	103.70	83.72	28.12
BoF total	12.85	9.57	3.35	11.75	29.21	7.55	17.15	26.51	13.19	39.61	37.17	105.72	58.54	23.75	63.96	27.95	12.30	8.55

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-04
0	0.06	0.00	0.17	0.00	0.00	0.00	2.55	0.18	2.00	0.12	1.63	24.78	24.79	4.32	0.01	0.52	0.25	0.02	1.81
1	6.44	5.39	0.07	3.86	2.81	4.17	19.09	41.81	4.53	9.02	8.98	32.51	24.61	27.74	3.81	2.11	7.41	2.14	9.71
2	1.92	8.79	9.56	1.24	2.24	0.95	5.34	22.41	24.17	5.30	6.94	18.43	40.10	28.72	15.27	4.78	3.34	13.50	11.96
3	0.91	1.76	8.60	11.36	0.88	1.57	1.98	10.63	22.71	19.25	4.26	8.71	6.19	37.22	20.80	12.88	4.87	3.21	10.95
4	1.90	0.82	1.58	10.37	6.92	0.60	1.78	3.77	11.56	11.62	12.52	5.84	4.29	10.91	23.00	14.27	10.12	4.64	7.16
5	2.65	1.66	1.28	2.18	4.92	1.72	0.36	1.71	4.67	3.60	6.74	9.92	3.48	4.15	5.48	12.32	7.57	8.21	4.74
6	2.81	0.71	1.42	1.20	0.94	1.04	1.75	0.70	1.54	1.50	1.72	5.53	4.81	1.98	2.87	2.35	6.40	7.87	2.52
7	1.34	1.47	1.29	1.06	0.35	0.17	1.02	1.43	1.07	0.55	1.39	2.72	1.71	5.06	2.09	2.61	2.22	4.52	1.63
8	1.05	0.52	1.08	0.91	0.36	0.13	0.14	0.37	1.50	0.17	0.91	1.05	0.68	1.95	3.18	1.51	1.36	2.24	0.97
9	0.65	0.44	0.45	0.67	0.26	0.05	0.05	0.09	0.37	0.28	0.25	0.79	0.30	1.08	1.71	2.59	0.50	0.73	0.50
10	0.36	0.13	0.37	0.80	0.19	0.04	0.08	0.00	0.30	0.18	0.16	0.17	0.06	0.73	0.91	0.95	0.59	0.66	0.27
11	0.12	0.10	0.18	0.08	0.04	0.09	0.01	0.00	0.12	0.02	0.11	0.17	0.02	0.08	0.62	0.40	0.27	0.32	0.11
12	0.01	0.08	0.08	0.08	0.02	0.02	0.05	0.02	0.02	0.01	0.01	0.11	0.01	0.00	0.03	0.00	0.10	0.12	0.05
13	0.00	0.00	0.05	0.02	0.00	0.03	0.09	0.00	0.07	0.00	0.00	0.04	0.00	0.03	0.04	0.03	0.01	0.00	0.02
14	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.02
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unknown	0.48	0.05	0.02	0.00	0.09	0.02	0.00	0.02	0.27	0.04	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.07
4X total	20.70	21.93	26.23	33.83	20.02	10.61	34.28	83.14	74.90	51.69	45.64	110.79	111.06	123.97	79.81	57.32	45.02	48.23	52.51
SS total	26.89	32.96	31.14	42.94	28.36	17.11	36.52	105.60	81.94	69.99	65.11	191.56	152.85	212.82	120.27	79.34	67.82	79.91	75.19
BoF total	14.58	11.05	21.37	24.83	11.77	4.17	32.06	60.91	67.92	33.60	26.38	30.88	69.70	36.04	39.78	35.53	22.46	16.88	30.05

Table 17a. 4X5Y Haddock summer research vessel survey Scotian Shelf stratas 470-481 - mean length-at-age (cm).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0								8.5		7.3	6.5	8.3	6.5	7.7	8.2		6.5	
1	21.0	20.6	20.0	21.3	20.8	21.9	20.5	21.7	19.0	19.5	19.8	16.9	17.7	17.6	17.8	19.1	19.4	19.3
2	33.8	29.2	26.9	29.9	30.9	31.5	31.1	34.7	33.0	29.6	31.7	29.7	24.1	25.5	24.5	28.7	29.8	29.6
3	41.0	40.7	39.0	34.9	38.8	40.6	38.4	42.2	41.8	36.4	39.0	40.8	36.0	34.3	32.0	33.7	36.3	36.7
4	45.0	46.4	48.2	48.4	44.3	47.8	47.9	47.6	48.6	47.2	47.9	46.9	45.7	44.6	40.2	40.6	38.7	40.9
5	49.7	51.1	52.6	53.4	53.8	54.2	51.6	53.4	53.6	52.3	53.4	53.3	50.5	52.1	47.4	44.5	44.6	43.6
6	52.4	52.8	55.8	58.8	58.2	58.2	57.4	55.8	57.4	58.2	57.1	57.6	55.7	55.3	54.2	48.7	47.5	47.0
7	56.4	54.7	56.1	59.2	61.3	63.6	61.6	63.0	60.7	60.7	61.4	60.1	59.0	60.2	57.1	53.9	50.3	50.3
8	60.5	57.6	59.7	60.6	62.4	64.7	60.5	64.9		62.1	62.9	64.7	63.0	61.2	59.4	56.2	54.2	51.7
9	62.2	62.9	62.2	61.8	63.1	65.6		69.9		69.3	66.5	66.1	68.1	63.0	61.8	57.1	57.9	54.2
10	67.3	69.5	64.4	63.8	62.2	69.7		64.5			67.5	68.0		63.2		60.9	58.4	56.2
11	68.0	69.4	68.5	67.7	66.5	68.4			62.5		70.5	70.5	66.5	61.4			64.8	58.5
12	60.5	72.0	76.5			67.1	64.5	67.0						73.8			67.0	
13							66.5	70.5						70.5			60.5	
14								66.4								66.5		
15										68.5								
16																		
17																		

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-04
0	6.5	10.5					9.1	8.5	9.8	8.3	9.6	9.9	10.1	9.0	6.5	9.1	8.6	4.9	8.3
1	18.5	20.3	21.5	20.5	18.9	22.1	22.3	18.2	17.8	20.8	18.6	21.4	21.7	20.4	18.7	18.7	20.7	20.5	19.9
2	31.9	30.8	30.6	34.5	30.1	31.6	32.9	30.3	26.3	27.7	28.0	25.5	31.2	28.5	26.4	26.5	26.1	27.4	29.5
3	38.9	40.3	39.8	40.3	39.4	39.6	39.3	39.2	36.4	32.7	33.6	35.3	35.8	35.9	32.7	31.8	35.1	32.2	37.4
4	42.1	41.9	44.7	46.5	45.1	45.9	45.5	45.9	42.7	39.7	36.9	37.5	40.9	38.1	38.2	37.0	37.3	37.7	43.5
5	45.8	47.1	49.7	49.9	48.9	49.3	48.1	49.4	45.7	45.3	42.2	40.5	42.2	43.6	40.0	41.0	39.6	39.2	48.1
6	45.9	50.2	50.4	55.0	54.4	53.6	49.5	50.9	50.6	46.6	46.2	43.7	44.8	44.8	44.4	43.2	41.9	40.9	51.5
7	48.0	49.6	50.1	54.7	56.0	54.6	51.9	53.2	52.4	50.4	49.2	44.9	47.2	46.1	45.2	44.6	43.9	43.0	54.0
8	50.2	50.5	51.9	54.6	53.2	54.4	55.5	56.3	52.8	54.2	53.4	47.9	48.9	47.6	45.6	46.3	44.4	45.0	55.7
9	51.3	51.6	54.4	52.3	52.5	51.0	53.3	60.3	56.1	54.0	52.0	47.8	50.1	49.9	47.3	46.5	46.3	47.3	57.2
10	51.4	54.7	49.5	49.9	62.4	58.0	54.5		49.9	54.0	54.5	51.1	54.2	46.1	48.2	47.6	48.0	46.4	57.6
11	59.2	55.5	58.0	63.3	58.5	53.6	58.5		58.5	60.4	57.8	54.2	56.5	53.9	39.5	50.0	48.9	47.8	60.3
12	62.5	50.9	54.0	58.4	62.5	56.5	51.5	54.5	59.6	62.5	54.5	55.1	62.5		56.5		49.6	48.5	60.8
13					68.5	56.4	52.0		52.5			51.4		52.5			52.5		59.4
14		66.5	66.5	68.5		74.5								74.5				58.5	69.1
15																		58.5	68.5
16																			
17				64.5															64.5

Table 17b. NAFO divisions 4X5Y Haddock summer research vessel survey Bay of Fundy stratas 482-495 - mean length-at-age (cm).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0										6.5				8.3			6.5	
1	22.0		16.5	24.5	22.0	22.2	23.3	23.6	19.6	21.3	22.8	21.6	22.1	22.6	24.1	24.0	23.7	25.2
2	34.8	32.9		31.5	32.4	36.7	33.9	38.4	37.8	34.6	34.6	33.3	31.7	33.2	31.7	36.1	36.7	37.9
3	41.5	44.6	44.3	39.8	42.5	46.2	43.3	46.8	46.7	44.3	42.9	41.6	41.1	42.2	36.5	42.8	45.3	46.4
4	47.1	49.8	51.2	52.6	49.3	51.1	49.8	52.7	53.0	52.6	51.3	50.1	50.3	49.9	46.3	47.2	50.3	51.9
5	50.0	53.2	54.8	57.8	59.8	54.5	55.7	57.9	56.8	59.1	57.2	59.4	56.0	57.1	52.3	52.7	52.2	54.2
6	51.5	54.3	57.0	61.8	63.9	65.7	62.5	61.0	59.3	62.8	62.9	63.3	61.7	61.7	57.6	61.9	57.1	60.5
7	56.0	55.8	59.6	61.6	61.1		68.2	67.4	62.8	65.1	63.4	66.2	65.4	64.4	61.7	63.9	58.1	61.6
8	58.9	60.9	61.8	60.9	65.6		66.5	67.2	66.2	67.8	65.4	62.5	68.5	66.5	63.5	64.7	56.5	58.5
9	58.7	63.2	64.2	65.2	62.8		65.7	69.7		72.4	70.5	69.3	68.8	66.7	66.8	63.7	64.4	65.8
10	62.7	74.5	72.9	63.9	66.6	64.5	66.5	65.6		69.1		74.9	74.6	70.4	69.4	67.1	63.5	70.5
11	68.5				69.6	65.7	72.5	66.5				72.5	75.9	73.3	70.5	62.7		66.5
12		73.4				66.7	67.7	76.5	68.5			74.5		66.5	72.5	66.5	64.9	76.5
13			78.5	70.5			71.7	73.2	72.5					76.5	66.5	66.5	62.5	
14								74.1	73.2	72.5						70.5		65.9
15									70.3	73.9								
16																		
17																		

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-04
0			8.5				8.1	7.3	8.1	8.5	8.5	8.9	8.5	9.0		7.5	8.1		8.0
1	24.9	21.9		23.9	22.4	21.7	25.0	20.0	21.2	23.0	21.0	23.4	26.1	23.8	23.4	21.9	22.8	19.5	22.7
2	37.2	35.5	37.0	43.6	35.1	38.2	36.3	34.9	30.3	30.8	33.5	32.6	35.7	30.7	31.1	31.3	25.7	32.5	34.3
3	47.1	41.2	46.2	47.1	34.5	45.6	47.2	45.2	42.2	39.1	40.4	43.8	40.3	41.5	37.9	39.1	38.8	39.7	42.7
4	51.0	49.7	53.6	53.4	53.1	51.9	54.5	51.4	51.4	46.5	45.7	47.8	45.8	45.2	43.1	46.7	44.1	43.5	49.7
5	55.0	52.6	55.6	54.8	58.7	55.9	70.5	57.7	56.5	53.6	50.2	49.2	46.3	48.5	48.6	51.2	46.5	44.9	54.6
6	57.0	56.0	58.6	61.5	58.7	59.4	62.5	59.9	58.0	58.5	55.8	51.4	47.3	58.9	49.9	53.5	51.0	49.5	58.4
7	63.9	57.5	59.9	62.3	62.8	61.9	64.4	61.9	60.3	59.4	56.9	54.5	55.6	51.9	51.4	54.4	52.4	51.4	60.4
8	59.6	53.9	63.9	64.1	61.1	60.5	67.6	62.8	61.6	71.8	59.6	60.3	56.3	53.6	54.3	54.0	53.0	51.9	61.8
9	66.8	62.5	65.0	65.6	67.6			70.5	64.5	71.8	60.8	60.9	61.9	56.6	56.0	55.3	62.5	59.8	64.7
10	62.1	62.5	63.8	58.3	60.8				67.2			72.9	76.5	57.6	56.1	56.8	55.6	62.5	66.0
11		63.3	65.5	70.5	72.5	66.4			58.5		64.5	59.4			59.5	55.9	56.2	46.5	66.2
12			62.5	70.5											62.5		67.7		69.2
13			68.0	70.5			70.5		82.5						61.1	66.5			70.5
14												68.5							70.8
15																			72.1
16										58.5									
17																			

Table 18a. NAFO divisions 4X5Y Haddock summer research vessel survey stratas 470-481 - mean weight-at-age (kg).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0																		
1	0.080	0.102	0.078	0.092	0.086	0.101	0.082	0.100	0.068	0.079	0.071	0.013	0.045	0.024	0.036	0.068	0.051	0.063
2	0.389	0.246	0.203	0.288	0.306	0.324	0.319	0.440	0.377	0.266	0.347	0.262	0.143	0.154	0.143	0.259	0.273	0.269
3	0.760	0.702	0.638	0.472	0.639	0.709	0.594	0.823	0.798	0.538	0.644	0.768	0.499	0.393	0.332	0.395	0.487	0.535
4	1.051	1.039	1.255	1.255	0.942	1.189	1.108	1.219	1.311	1.162	1.164	1.114	1.029	0.908	0.688	0.683	0.607	0.749
5	1.352	1.390	1.614	1.694	1.663	1.800	1.390	1.693	1.828	1.539	1.610	1.626	1.349	1.438	1.105	0.914	0.946	0.878
6	1.665	1.575	1.952	2.276	2.117	2.147	1.899	1.908	2.208	2.136	2.001	2.014	1.817	1.683	1.594	1.192	1.103	1.117
7	2.057	1.701	2.053	2.292	2.557	2.828	2.266	2.801	2.571	2.410	2.499	2.394	2.210	2.188	1.843	1.618	1.372	1.321
8	2.457	2.035	2.427	2.492	2.639	3.013	2.350	2.855		2.726	2.678	3.137	2.645	2.253	2.046	1.707	1.690	1.431
9	2.688	2.533	2.782	2.567	2.871	3.251		4.360		3.514	3.384	3.049	3.292	2.454	2.150	1.853	1.924	1.687
10	3.255	4.041	3.057	2.932	2.651	3.501		2.775			3.319	3.425		2.275		2.109	1.899	1.721
11	3.594	3.516	3.700	3.386	3.144	3.516			2.600		3.400	3.900	3.100	2.353			2.803	2.100
12	2.225	3.294	4.600			3.060	2.350	3.354						3.890			3.352	
13							2.500	4.000						3.400			2.000	
14								3.213								2.700		
15										3.100								
16																		
17																		

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-04
0							0.007	0.007	0.010	0.005	0.009	0.009	0.011	0.007	0.003	0.007	0.005	0.002	0.007
1	0.050	0.086	0.109	0.078	0.076	0.098	0.110	0.059	0.053	0.089	0.065	0.100	0.096	0.083	0.061	0.066	0.077	0.080	0.074
2	0.343	0.296	0.315	0.435	0.282	0.322	0.360	0.271	0.181	0.219	0.210	0.180	0.299	0.227	0.174	0.190	0.176	0.201	0.271
3	0.600	0.671	0.693	0.668	0.630	0.630	0.629	0.613	0.491	0.360	0.380	0.445	0.466	0.472	0.342	0.335	0.417	0.346	0.559
4	0.776	0.780	0.989	1.038	0.984	0.984	0.942	0.946	0.777	0.655	0.514	0.544	0.689	0.567	0.547	0.507	0.513	0.540	0.892
5	0.969	1.143	1.322	1.282	1.238	1.211	1.158	1.172	0.976	0.959	0.742	0.694	0.759	0.821	0.625	0.693	0.616	0.613	1.206
6	1.014	1.311	1.434	1.603	1.640	1.564	1.282	1.290	1.248	1.014	0.975	0.861	0.912	0.879	0.831	0.791	0.736	0.713	1.480
7	1.245	1.299	1.357	1.627	1.811	1.702	1.466	1.483	1.410	1.270	1.220	0.958	1.101	0.990	0.885	0.866	0.813	0.811	1.728
8	1.353	1.380	1.545	1.687	1.513	1.695	1.748	1.812	1.467	1.532	1.537	1.166	1.205	1.067	0.927	0.974	0.843	0.939	1.883
9	1.629	1.411	1.851	1.550	1.630	1.396	1.567	2.153	1.770	1.592	1.439	1.153	1.263	1.259	1.022	0.984	1.004	1.046	2.092
10	1.477	1.648	1.343	1.213	2.719	2.226	1.705		1.234	1.535	1.581	1.349	1.482	1.080	1.083	1.042	1.077	1.068	2.095
11	2.203	1.658	2.186	2.763	2.100	1.621	2.195		2.000	2.045	2.058	1.645	1.858	1.644	0.747	1.235	1.203	1.132	2.423
12	2.900	1.310	1.816	2.322	2.760	1.995	1.274	1.510	2.019	1.358	1.465	1.642	2.200				1.164	1.204	2.357
13					3.500	1.682	1.406		1.310			1.347		1.450			1.304		2.173
14		2.400	3.300	3.400		4.540								3.810				1.830	3.338
15																		2.205	3.100
16																			
17				2.945															2.945

Table 18b. NAFO divisions 4X5Y haddock summer research vessel survey stratas 482-495 - mean weight-at-age (kg).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
0																		
1	0.105		0.063	0.125	0.096	0.120	0.134	0.126	0.033	0.097	0.116	0.112	0.098	0.102	0.144	0.130	0.140	0.170
2	0.478	0.333		0.331	0.336	0.535	0.426	0.642	0.604	0.432	0.518	0.423	0.365	0.401	0.358	0.512	0.555	0.536
3	0.763	0.954	0.995	0.689	0.850	1.100	0.896	1.164	1.202	0.955	0.967	0.895	0.822	0.836	0.574	0.879	1.041	1.093
4	1.134	1.283	1.553	1.565	1.299	1.530	1.311	1.597	1.727	1.624	1.514	1.434	1.437	1.390	1.131	1.170	1.466	1.496
5	1.430	1.637	1.867	2.074	2.236	1.800	1.752	2.212	2.176	2.242	1.998	2.349	1.977	1.961	1.572	1.554	1.658	1.728
6	1.530	1.778	2.221	2.679	2.648	3.006	2.100	2.539	2.487	2.688	2.617	2.758	2.600	2.552	2.149	2.451	1.998	2.233
7	2.017	1.814	2.942	2.577	2.344		3.068	3.335	2.830	3.047	2.414	3.219	3.074	2.870	2.424	2.744	1.903	2.575
8	2.251	2.468	2.706	2.419	3.049		2.600	3.370	3.422	3.771	3.031	3.000	3.461	3.117	2.846	2.889	1.900	2.246
9	2.038	2.692	3.024	2.995	2.528		2.685	3.738		4.204	3.775	3.663	3.482	3.221	3.055	2.678	2.781	2.906
10	2.626	4.200	4.704	2.849	3.182	2.700	2.600	3.099		3.477		4.209	4.212	4.013	3.769	3.250	2.809	4.100
11	3.700				3.664	3.121	3.500	3.500				3.800	4.643	3.875	2.350	2.635		2.675
12		5.418				3.383	3.292	4.200	4.200			4.000		3.400	3.500	3.200	2.611	6.000
13			6.200	4.000			3.897	3.592	3.900					4.700	2.300	3.100	2.400	
14								4.315	4.195	3.600						3.300		2.870
15									4.237	5.123								
16																		
17																		

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1970-04
0							0.00592	0.00516	0.005	0.004	0.00712	0.00636	0.00529	0.00514		0.00384	0.00482		0.005
1	0.164	0.119		0.155	0.119	0.115	0.163	0.077	0.083	0.130	0.093	0.135	0.183	0.137	0.127	0.106	0.105	0.075	0.119
2	0.686	0.519	0.591	0.930	0.477	0.599	0.522	0.432	0.291	0.305	0.399	0.375	0.468	0.313	0.312	0.317	0.173	0.357	0.456
3	1.198	0.824	1.127	1.158	0.400	1.014	1.183	0.967	0.796	0.643	0.703	0.886	0.690	0.775	0.569	0.649	0.589	0.666	0.881
4	1.445	1.441	1.744	1.672	1.576	1.521	1.710	1.376	1.416	1.053	1.000	1.127	1.029	0.955	0.824	1.048	0.857	0.817	1.356
5	1.884	1.572	1.842	1.770	2.183	1.770	3.482	1.878	1.829	1.574	1.321	1.248	1.120	1.161	1.155	1.349	0.983	0.962	1.781
6	2.275	1.937	2.296	2.552	2.184	2.093	2.596	2.091	2.183	2.222	1.805	1.442	1.241	2.055	1.246	1.510	1.303	1.243	2.173
7	3.038	2.110	2.425	2.531	2.868	2.319	2.860	2.339	2.246	2.228	2.029	1.702	1.806	1.461	1.321	1.551	1.407	1.312	2.395
8	2.392	1.864	2.873	2.918	2.789	2.140	3.146	2.551	2.257	3.331	2.285	2.115	2.075	1.635	1.535	1.453	1.470	1.370	2.570
9	3.230	2.900	3.176	3.270	3.716			3.101	2.733	3.767	2.601	2.472	2.641	1.904	1.725	1.665	2.230	1.854	2.922
10	2.981	2.575	2.853	2.206	2.495				3.221			4.171	4.445	1.996	1.849	1.832	1.640	2.362	3.145
11		2.601	2.937	4.535	3.775	3.173			2.255		2.350	2.265			2.228	1.576	1.555	1.086	3.032
12			3.200	3.420											2.025		2.501		3.623
13			3.513	3.555			3.856		5.905						2.430	2.802			3.743
14												3.260							3.590
15																			4.680
16										2.054									2.054
17																			

Table 19. NAFO divisions 4X5Y haddock indices in the 1996-2005 ITQ survey.

mean numbers-at-age per standard tow

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	AVG
0	0.5	0.0	0.3	3.6	5.4	0.6	0.0	0.1	0.1	0.0	1.2
1	6.9	14.7	14.9	98.8	75.7	58.9	17.3	6.2	38.6	7.2	36.9
2	41.3	9.5	29.3	39.7	75.7	54.5	29.3	17.1	12.8	35.9	34.4
3	25.1	33.1	8.3	18.2	12.0	56.5	30.4	30.6	12.3	4.1	25.2
4	9.0	19.4	21.5	7.1	8.5	13.5	29.9	26.3	16.1	4.7	16.8
5	3.5	5.0	8.0	11.1	7.2	5.0	6.5	13.9	10.0	7.7	7.8
6	0.9	1.6	1.2	4.6	8.1	2.1	3.0	2.4	6.9	6.9	3.4
7	0.7	0.6	0.8	2.1	2.6	5.3	2.2	2.4	2.2	3.6	2.1
8	0.8	0.2	0.4	0.6	1.0	1.9	3.0	1.2	1.3	1.8	1.2
9	0.2	0.3	0.2	0.5	0.3	1.0	1.6	2.0	0.6	0.6	0.7
10	0.2	0.2	0.2	0.1	0.1	0.7	0.9	0.8	0.6	0.5	0.4
11	0.0	0.0	0.1	0.1	0.0	0.1	0.8	0.3	0.3	0.2	0.2
12	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
unknown	0.2	0.1	0.3	0.5	2.1	0.6	0.5	0.3	0.5	2.2	0.6
SUM	89.3	84.7	85.5	187.1	198.7	200.7	125.4	103.6	102.5	75.5	130.8
wt per tow	44.2	47.9	40.2	53.9	65.5	77.5	54.2	54.9	37.3	33.5	52.8
4+ wt per tow											
total	21.4	25.8	26.9	22.3	27.4	25.5	35.1	43.2	27.5	20.0	28.3
470-481	22.5	26.5	27.7	25.8	35.0	37.7	48.8	43.8	41.1	19.1	32.8
482-495	13.5	28.0	27.8	25.8	22.3	20.7	29.7	47.7	19.6	1.8	23.7
482-495+499	12.2	26.5	28.0	25.6	20.7	17.3	24.5	40.1	15.5	2.1	21.3
recruits 1+2											
total	8.2	22.0	27.3	87.3	65.1	44.1	17.2	9.5	37.3		35.3
470-481	13.4	17.6	42.8	94.8	88.3	76.2	17.8	11.6	17.9		42.3
482-495	2.1	13.1	7.9	55.6	24.3	6.4	6.4	3.7	8.2		14.2
482-495+499	3.6	25.3	15.0	81.0	46.0	17.3	16.7	7.7	20.5		25.9
yearclass	1995	1996	1997	1998	1999	2000	2001	2002	2003		

Table 20a. SPA results – residuals.

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
2	-0.02	0.27	-2.19	0.39	0.43	-0.77	-0.95	0.81	-0.75	-0.08
3	-0.62	0.24	-0.72	-0.99	0.96	-0.87	-0.45	1.44	-0.27	-0.22
4	-0.36	0.14	-0.47	-0.41	-0.50	-0.09	-0.74	1.30	-0.90	-0.06
5	-0.32	0.21	-0.39	0.07	0.27	-1.11	0.33	1.03	-0.60	-0.15
6	0.46	0.39	-0.41	-0.40	0.20	-0.03	-0.19	1.37	0.00	0.22
7	-0.31	0.62	-0.10	-0.14	0.08	0.02	-0.22	1.15	0.23	0.67
8	-1.46	0.56	0.23	0.49	0.50	0.35	-0.33	1.41	-0.62	1.19
9	-0.09	-0.96	0.01	-0.29	1.02	-0.46	-0.47	0.82	0.00	1.15
10	0.50	-0.82	-3.07	-0.20	0.09	0.75	-1.75	1.05	0.00	0.19
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
2-10	-0.12	0.04	-0.40	-0.08	0.17	-0.12	-0.26	0.58	-0.16	0.16

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
2	-0.50	0.69	0.59	-0.99	0.49	0.57	0.80	-0.34	-0.35	0.05
3	0.13	-0.41	0.08	0.05	0.09	0.55	0.44	-0.31	-0.63	-0.32
4	-0.01	-0.01	-0.42	-0.24	0.63	0.16	0.42	0.12	-0.28	-0.46
5	0.65	-0.23	0.50	-0.29	0.23	0.90	-0.03	-0.40	0.50	-0.06
6	0.53	0.37	0.34	0.00	0.27	0.39	0.58	-0.20	-0.09	-0.44
7	0.46	0.12	1.24	-0.29	0.27	0.40	0.21	-0.26	-0.40	-0.33
8	0.64	-1.06	0.32	0.06	0.06	0.80	0.43	-0.32	-0.23	-0.74
9	1.14	0.22	0.56	0.44	1.16	0.65	0.60	-0.73	-0.08	-0.42
10	1.97	0.77	0.71	0.84	-0.06	1.24	0.44	0.18	0.14	-1.12
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
2-10	0.28	0.02	0.22	-0.02	0.17	0.31	0.22	-0.12	-0.08	-0.21

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
2	0.24	-0.68	-0.48	-1.44	-0.31	0.79	0.99	-0.06	0.04	0.88
3	0.11	0.51	-0.96	-0.74	-0.63	0.45	0.87	0.81	-0.23	0.33
4	-0.24	0.56	0.29	-1.15	-0.42	0.20	0.71	0.38	0.52	0.22
5	0.33	0.34	0.18	-0.73	-1.44	-0.20	0.64	-0.25	0.07	0.48
6	0.20	0.68	-0.17	-0.93	-0.30	-0.52	0.05	-0.19	-0.66	0.16
7	0.62	0.28	-0.09	-1.62	-0.67	-0.19	0.24	-0.69	0.08	0.10
8	-0.01	1.08	-0.14	-0.38	-1.39	-1.17	0.46	-1.04	0.46	0.38
9	-0.36	0.09	0.64	-1.50	-0.88	-1.37	-0.56	-0.70	-0.15	0.82
10	0.01	0.80	-0.52	-0.52	-0.60	0.00	0.43	-0.75	-0.72	-0.08
2	0	0	0	0	0	0	0.26	-0.73	0.22	0.39
3	0	0	0	0	0	0	0.11	0.49	-0.42	0.21
4	0	0	0	0	0	0	-0.15	0.28	0.45	-0.20
5	0	0	0	0	0	0	0.14	-0.13	0.03	0.37
6	0	0	0	0	0	0	-0.22	0.15	-0.74	0.25
7	0	0	0	0	0	0	0.08	-0.33	-0.20	0.11
8	0	0	0	0	0	0	0.06	-0.64	-0.13	0.05
9	0	0	0	0	0	0	-0.92	-0.38	-0.12	0.62
10	0	0	0	0	0	0	0.19	-0.48	-0.34	-0.45
2-10	0.05	0.20	-0.07	-0.50	-0.37	-0.11	0.19	-0.24	-0.10	0.26

Age	2000	2001	2002	2003	2004	2005
2	0.73	0.61	0.28	0.01	0.13	0.14
3	-0.15	0.72	0.33	0.17	0.08	0.14
4	-0.22	0.57	0.41	0.09	0.07	0.18
5	-0.13	-0.07	0.06	-0.01	-0.39	0.02
6	0.05	-0.44	-0.19	-0.55	-0.40	-0.14
7	-0.74	0.44	-0.14	-0.09	-0.39	-0.55
8	-0.76	-0.05	0.56	-0.01	-0.33	0.05
9	-0.36	0.22	0.35	0.80	-0.72	-0.61
10	-1.31	1.06	0.55	0.19	-0.31	-0.09
2	0.11	-0.01	-0.33	0.02	0.21	-0.14
3	-0.35	0.28	-0.15	0.17	0.15	-0.48
4	-0.16	0.17	0.05	0.09	-0.09	-0.43
5	0.38	-0.10	0.01	-0.11	-0.33	-0.26
6	0.84	-0.11	0.12	-0.26	-0.05	0.00
7	-0.05	0.75	0.18	0.09	-0.13	-0.50
8	-0.14	0.16	0.74	-0.01	-0.14	0.06
9	-0.10	0.40	0.54	0.80	-0.28	-0.55
10	-0.64	1.18	0.70	0.18	-0.13	-0.21
2-10	-0.17	0.32	0.23	0.09	-0.17	-0.19

Mean Square of the Residuals = 0.352828

	Est Param	CV	Bias
1	10.25750	0.437354	-0.015320
2	8.66552	0.311396	-0.015856
3	8.89227	0.262443	-0.003679
4	9.51291	0.236698	0.006162
5	9.56904	0.218597	0.011304
6	9.32748	0.223488	0.033418
7	8.16293	0.212999	0.041036
8	7.76441	0.196936	0.018729
9	7.21075	0.189248	0.019176

Table 20b. SPA results - population numbers.

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	25933	6201	48009	45081	24759	50553	53871	32856	44206	34234
2	12185	21232	5077	39269	36771	20270	41356	44089	26898	36192
3	5728	8992	16652	4137	29333	29461	14607	32678	34931	21953
4	7861	4014	5860	10475	3284	19688	19943	10460	23916	25475
5	2619	5035	2554	3105	6519	2401	11396	12442	6731	13047
6	2723	1790	2801	1624	1565	3682	1522	5971	7287	3560
7	15119	1740	1090	1700	847	808	2006	851	2273	3328
8	7375	8145	1360	810	842	518	435	907	370	892
9	750	4299	3588	1061	368	439	267	216	389	175
10	442	490	2572	1865	632	129	302	153	80	219
1-10	80736	61938	89564	109127	104920	127948	145704	140622	147080	139074

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	42957	46079	35635	43870	16299	12833	6457	9090	27699	24906
2	28028	35156	37725	29176	35918	13342	10507	5286	7442	22666
3	29557	22799	27688	30411	23824	28717	10717	8336	4247	5900
4	16902	21940	16614	19145	21622	18424	21606	7731	5882	3013
5	14648	11059	12200	11206	10227	13137	12863	13282	3588	3896
6	7089	6992	5164	5506	5462	5018	6541	6893	6723	2127
7	1925	2571	2764	2578	2287	2134	2744	3987	3747	3724
8	1574	1089	1028	851	1176	948	1287	2042	3001	2280
9	487	713	560	512	304	631	653	965	1620	1648
10	91	242	284	281	233	141	470	502	784	989
1-10	143257	148639	139662	143536	117351	95326	73846	58116	64732	71149

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	8080	12006	13233	24131	33670	29656	18463	22002	25208	63462
2	20380	6616	9827	10827	19730	27545	24277	15116	18014	20639
3	18385	16402	5400	7897	8738	16052	22468	19855	12363	14713
4	4381	13977	12377	4219	5952	6789	12391	17570	15948	10023
5	2016	3252	9133	7791	3006	4363	4955	9160	12750	12200
6	2343	1233	2133	5422	4759	2179	2904	3479	6584	8807
7	1461	1503	773	1497	3354	3015	1610	1913	2416	4316
8	2397	733	923	418	1040	2469	2072	959	1323	1457
9	1450	1395	376	529	242	821	1596	1223	658	712
10	893	917	866	169	308	185	495	874	828	412
1-10	61786	58032	55040	62898	80799	93072	91232	92152	96092	136740

Age	2000	2001	2002	2003	2004	2005
1	51420	37832	15648	9627	38455	23879
2	51958	42099	30974	12810	7882	31484
3	16863	42307	34377	25318	10463	6440
4	11628	13401	33142	27770	20119	8329
5	7697	8779	10019	24854	21333	15593
6	8869	5797	6486	7558	17752	16405
7	6359	6095	4161	4801	5599	12888
8	2992	4320	3791	2945	3611	4054
9	985	1947	2701	2423	2152	2700
10	533	604	1251	1733	1776	1557
1-10	159304	163180	142550	119838	129142	123330

Table 20c. SPA results - fishing mortality.

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.10	0.04	0.00	0.09	0.02	0.13	0.04	0.03	0.00	0.00
3	0.16	0.23	0.26	0.03	0.20	0.19	0.13	0.11	0.12	0.06
4	0.25	0.25	0.44	0.27	0.11	0.35	0.27	0.24	0.41	0.35
5	0.18	0.39	0.25	0.49	0.37	0.26	0.45	0.33	0.44	0.41
6	0.25	0.30	0.30	0.45	0.46	0.41	0.38	0.77	0.58	0.41
7	0.42	0.05	0.10	0.50	0.29	0.42	0.59	0.63	0.74	0.55
8	0.34	0.62	0.05	0.59	0.45	0.46	0.50	0.65	0.55	0.41
9	0.23	0.31	0.45	0.32	0.85	0.17	0.35	0.79	0.37	0.46
10	0.28	0.47	0.25	0.45	0.65	0.32	0.43	0.72	0.46	0.43
5-7	0.28	0.24	0.22	0.48	0.37	0.36	0.47	0.58	0.59	0.46

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.01	0.04	0.02	0.00	0.02	0.02	0.03	0.02	0.03	0.01
3	0.10	0.12	0.17	0.14	0.06	0.08	0.13	0.15	0.14	0.10
4	0.22	0.39	0.19	0.43	0.30	0.16	0.29	0.57	0.21	0.20
5	0.54	0.56	0.60	0.52	0.51	0.50	0.42	0.48	0.32	0.31
6	0.81	0.73	0.49	0.68	0.74	0.40	0.30	0.41	0.39	0.18
7	0.37	0.72	0.98	0.58	0.68	0.31	0.10	0.08	0.30	0.24
8	0.59	0.46	0.50	0.83	0.42	0.17	0.09	0.03	0.40	0.25
9	0.50	0.72	0.49	0.59	0.57	0.09	0.06	0.01	0.29	0.41
10	0.55	0.59	0.49	0.71	0.49	0.13	0.08	0.02	0.35	0.33
5-7	0.57	0.67	0.69	0.59	0.64	0.40	0.27	0.32	0.34	0.24

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.02	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
3	0.07	0.08	0.05	0.08	0.05	0.06	0.05	0.02	0.01	0.04
4	0.10	0.23	0.26	0.14	0.11	0.11	0.10	0.12	0.07	0.06
5	0.29	0.22	0.32	0.29	0.12	0.21	0.15	0.13	0.17	0.12
6	0.24	0.27	0.15	0.28	0.26	0.10	0.22	0.16	0.22	0.13
7	0.49	0.29	0.42	0.16	0.11	0.18	0.32	0.17	0.31	0.17
8	0.34	0.47	0.36	0.35	0.04	0.24	0.33	0.18	0.42	0.19
9	0.26	0.28	0.60	0.34	0.07	0.30	0.40	0.19	0.27	0.09
10	0.30	0.37	0.48	0.35	0.05	0.27	0.36	0.18	0.34	0.14
5-7	0.34	0.26	0.30	0.25	0.16	0.16	0.23	0.15	0.23	0.14

Age	2000	2001	2002	2003	2004	2005
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.01	0.00	0.00	0.00	0.00	0.00
3	0.03	0.04	0.01	0.03	0.03	0.00
4	0.08	0.09	0.09	0.06	0.05	0.03
5	0.08	0.10	0.08	0.14	0.06	0.04
6	0.18	0.13	0.10	0.10	0.12	0.04
7	0.19	0.27	0.15	0.08	0.12	0.04
8	0.23	0.27	0.25	0.11	0.09	0.04
9	0.29	0.24	0.24	0.11	0.12	0.03
10	0.26	0.26	0.25	0.11	0.11	0.03
5-7	0.15	0.17	0.11	0.11	0.10	0.04

Table 20d. SPA results – biomass.

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	1178	282	3471	1805	1243	2136	2897	1304	2274	1011
2	3426	2991	731	5967	6200	3632	8001	9000	5548	5503
3	3654	4914	6742	1331	13428	14267	7397	18122	22549	12468
4	7373	3644	5839	9884	2359	18639	18713	9780	26499	28277
5	3352	6238	3397	4776	9911	3240	15824	17832	10544	20932
6	4228	2679	4716	3197	3140	7269	2834	10445	14579	7675
7	29676	2893	2031	3712	2070	2023	4694	2000	5235	8234
8	16371	17150	2822	1863	2134	1426	1038	2404	1159	2660
9	1368	10576	9019	2766	965	1296	716	669	1888	651
10	1221	1528	8244	5382	1748	383	786	433	258	763
1-10	71849	52895	47012	40683	43198	54311	62900	71990	90532	88172
4+	63589	44708	36068	31580	22327	34276	44605	43563	60162	69192

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	1521	1435	1550	911	242	533	239	190	1089	1165
2	5324	6015	4879	3105	3868	2211	1516	712	1637	4102
3	15460	14057	14437	10650	7975	11458	4788	3392	2061	3677
4	17090	21411	17675	16556	14661	10720	14103	5907	4454	2387
5	22685	17275	17417	16153	12119	12071	11068	12569	4099	4400
6	13654	14071	10750	9850	9348	6651	7134	7419	8497	3035
7	4694	6208	7118	6069	4523	4126	3856	5185	5143	5442
8	4265	3033	3121	2268	2840	1874	2179	3148	4612	3675
9	1660	2135	1834	1443	835	1222	1353	1815	2943	2563
10	302	896	1061	894	759	351	971	912	1491	1780
1-10	86653	86537	79841	67898	57171	51217	47207	41248	36026	32225
4+	64350	65029	58976	53233	45085	37015	40664	36955	31239	23282

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	329	558	571	937	1588	1868	637	559	1639	2426
2	3959	1692	1569	1876	4017	6101	2792	1673	3107	2281
3	9928	9783	3304	3840	4917	9505	11008	5952	3800	5524
4	4379	14593	12110	3509	5802	6792	12410	12902	8222	4990
5	2501	4611	13600	9825	3666	5808	6418	10873	11739	8706
6	3650	2314	3707	9329	7232	3127	4644	4843	8632	8507
7	2621	2960	1693	2905	6205	5196	2735	3152	3814	5054
8	4404	1556	1625	777	2206	5079	3822	1812	2482	1914
9	2929	2796	753	739	379	2033	3741	2318	1292	978
10	1428	1539	1953	357	475	334	1216	1341	1309	778
1-10	36130	42401	40884	34093	36487	45845	49423	45427	46035	41158
4+	21912	30369	35441	27441	25965	28369	34986	37241	37490	30927

Age	2000	2001	2002	2003	2004	2005
1	2751	2770	878	452	1630	0
2	10504	6707	4177	1659	860	4537
3	5515	19526	10487	6906	3280	1721
4	8052	8100	19443	14304	9055	4390
5	5366	7957	6769	20544	14641	9563
6	8084	5014	5934	6515	15391	12078
7	7213	6256	3979	4836	5308	11641
8	4062	5231	3764	3103	3326	3929
9	1593	2772	3098	2740	2238	2771
10	979	690	1460	2129	1998	1661
1-10	54120	65023	59990	63188	57725	52291
4+	35349	36020	44447	54171	51957	46033

Table 20e. SPA results – PR.

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.24	0.06	0.00	0.15	0.02	0.28	0.07	0.04	0.00	0.00
3	0.38	0.37	0.58	0.05	0.24	0.41	0.22	0.14	0.16	0.11
4	0.60	0.40	0.98	0.46	0.13	0.76	0.46	0.30	0.55	0.64
5	0.43	0.63	0.56	0.83	0.44	0.57	0.76	0.42	0.59	0.75
6	0.60	0.48	0.67	0.76	0.54	0.89	0.64	0.97	0.78	0.75
7	1.00	0.08	0.22	0.85	0.34	0.91	1.00	0.80	1.00	1.00
8	0.81	1.00	0.11	1.00	0.53	1.00	0.85	0.82	0.74	0.75
9	0.55	0.50	1.00	0.54	1.00	0.37	0.59	1.00	0.50	0.84
10	0.67	0.76	0.56	0.76	0.76	0.70	0.73	0.91	0.62	0.78

Age	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.01	0.05	0.02	0.00	0.03	0.04	0.07	0.04	0.08	0.02
3	0.12	0.16	0.17	0.17	0.08	0.16	0.31	0.26	0.35	0.24
4	0.27	0.53	0.19	0.52	0.41	0.32	0.69	1.00	0.53	0.49
5	0.67	0.77	0.61	0.63	0.69	1.00	1.00	0.84	0.80	0.76
6	1.00	1.00	0.50	0.82	1.00	0.80	0.71	0.72	0.98	0.44
7	0.46	0.99	1.00	0.70	0.92	0.62	0.24	0.14	0.75	0.59
8	0.73	0.63	0.51	1.00	0.57	0.34	0.21	0.05	1.00	0.61
9	0.62	0.99	0.50	0.71	0.77	0.18	0.14	0.02	0.73	1.00
10	0.68	0.81	0.50	0.86	0.66	0.26	0.19	0.04	0.88	0.80

Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.04	0.00	0.03	0.03	0.04	0.00	0.00	0.00	0.00	0.00
3	0.14	0.17	0.08	0.23	0.19	0.20	0.13	0.11	0.02	0.21
4	0.20	0.49	0.43	0.40	0.42	0.37	0.25	0.63	0.17	0.32
5	0.59	0.47	0.53	0.83	0.46	0.70	0.38	0.68	0.40	0.63
6	0.49	0.57	0.25	0.80	1.00	0.33	0.55	0.84	0.52	0.68
7	1.00	0.62	0.70	0.46	0.42	0.60	0.80	0.89	0.74	0.89
8	0.69	1.00	0.60	1.00	0.15	0.80	0.83	0.95	1.00	1.00
9	0.53	0.60	1.00	0.97	0.27	1.00	1.00	1.00	0.64	0.47
10	0.61	0.79	0.80	1.00	0.19	0.90	0.90	0.95	0.81	0.74

Age	2000	2001	2002	2003	2004	2005
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.03	0.00	0.00	0.00	0.00	0.00
3	0.10	0.15	0.04	0.21	0.25	0.00
4	0.28	0.33	0.36	0.43	0.42	0.75
5	0.28	0.37	0.32	1.00	0.50	1.00
6	0.62	0.48	0.40	0.71	1.00	1.00
7	0.66	1.00	0.60	0.57	1.00	1.00
8	0.79	1.00	1.00	0.79	0.75	1.00
9	1.00	0.89	0.96	0.79	1.00	0.75
10	0.90	0.96	1.00	0.79	0.92	0.75

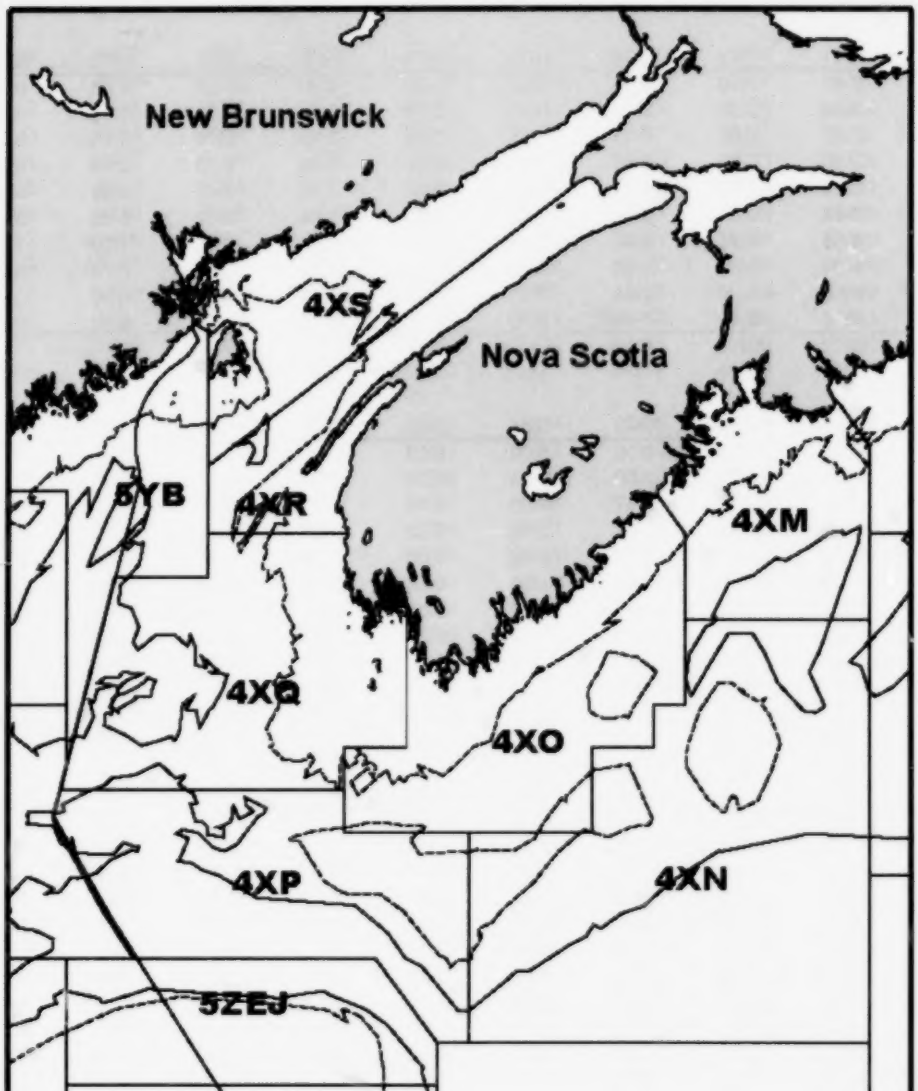


Figure 1. Statistical unit areas in NAFO divisions 4X, 5Y, and 5Z.

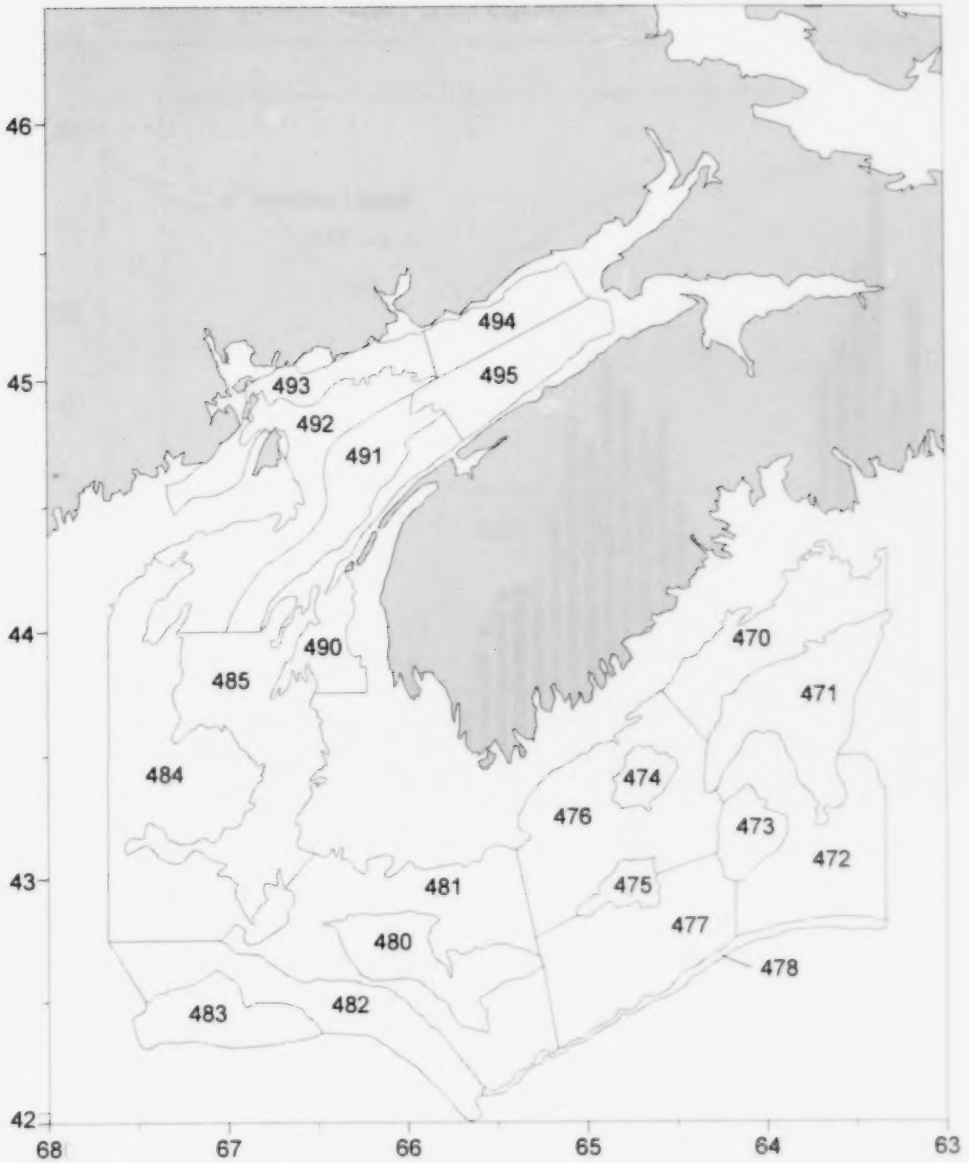


Figure 2. Stratification scheme for the summer research vessel survey in NAFO Division 4X.

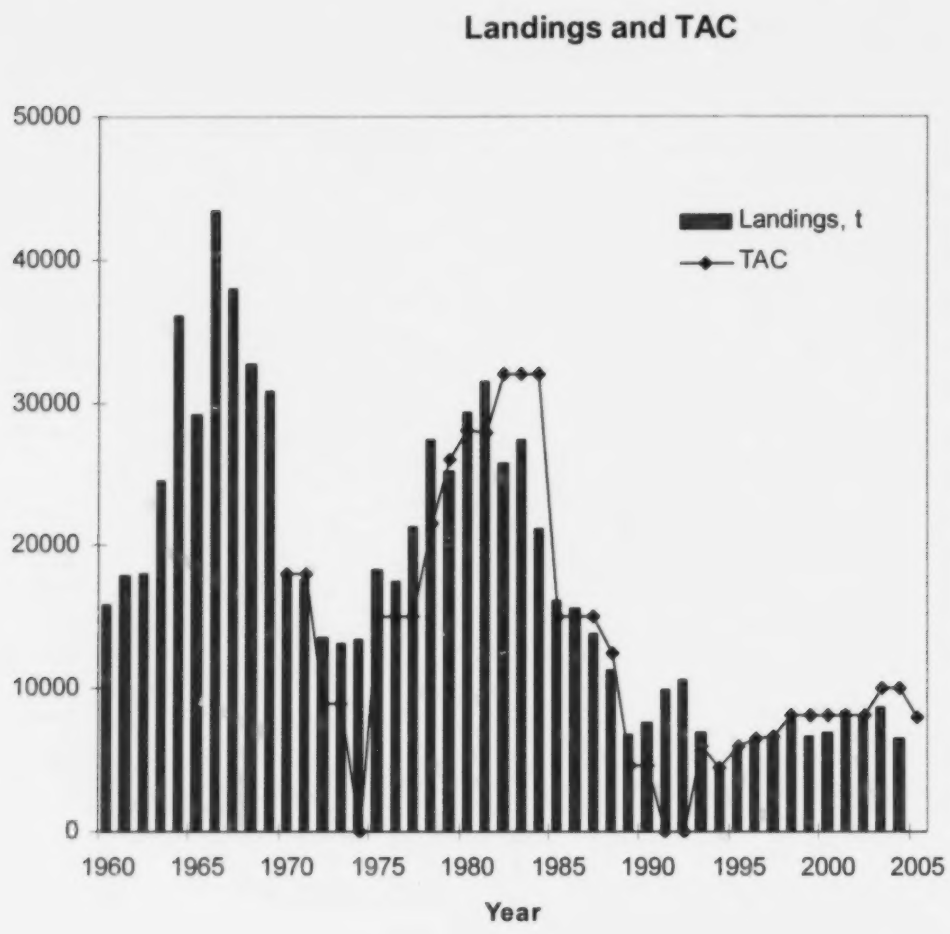


Figure 3. Long-term trends in NAFO divisions 4X5Y haddock landings and TAC.

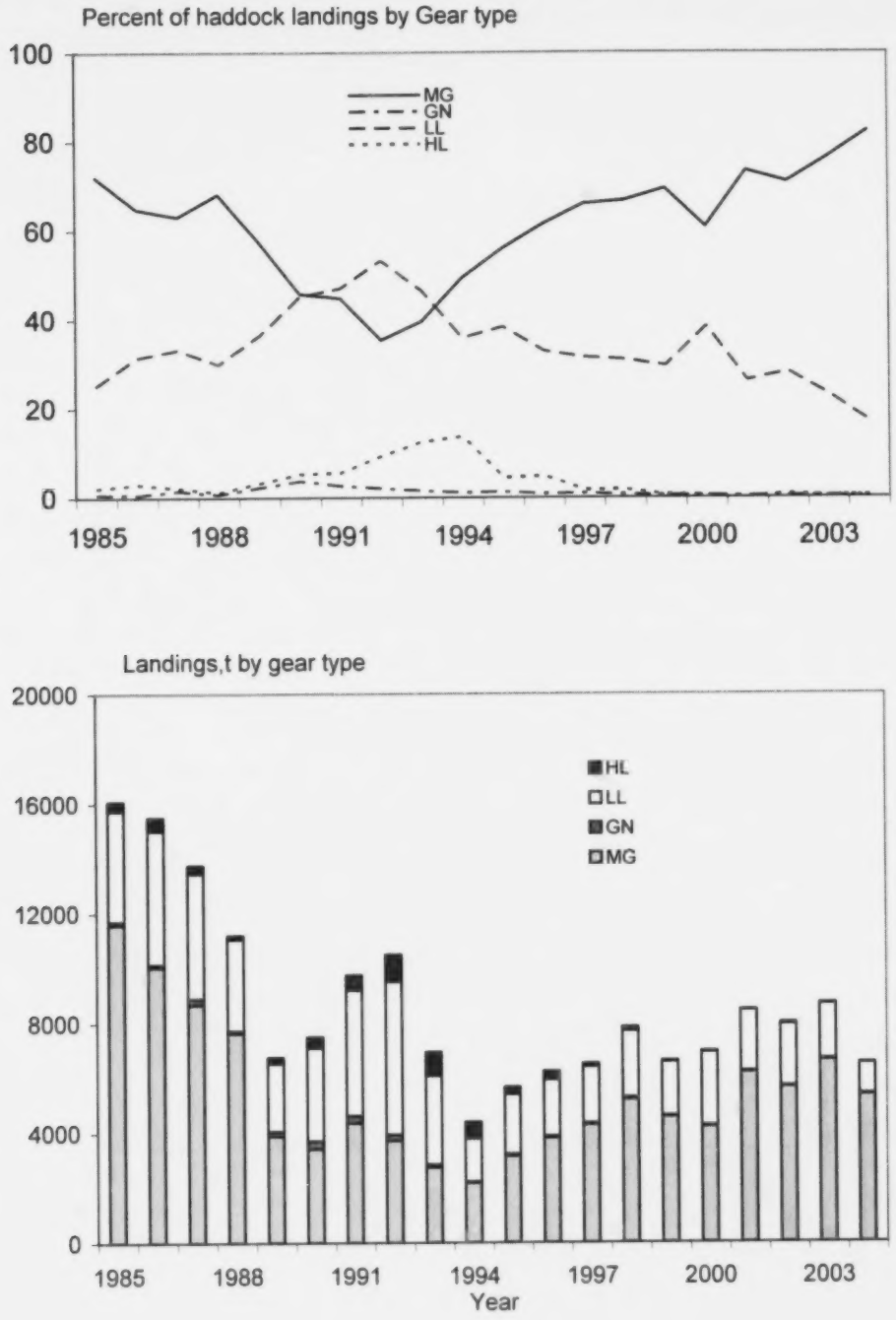
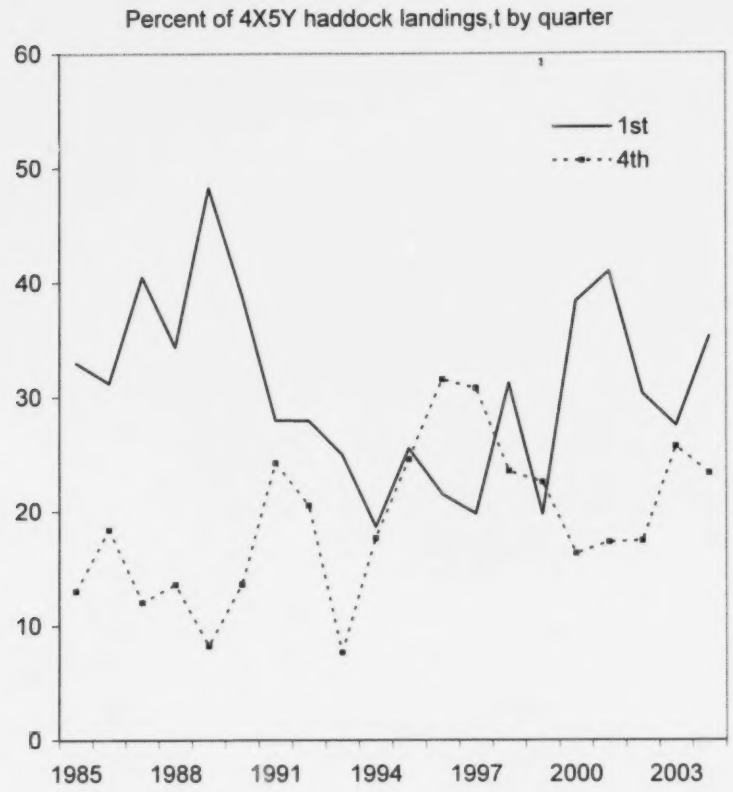


Figure 4. NAFO divisions 4X5Y haddock landings by gear type, 1985-2004.



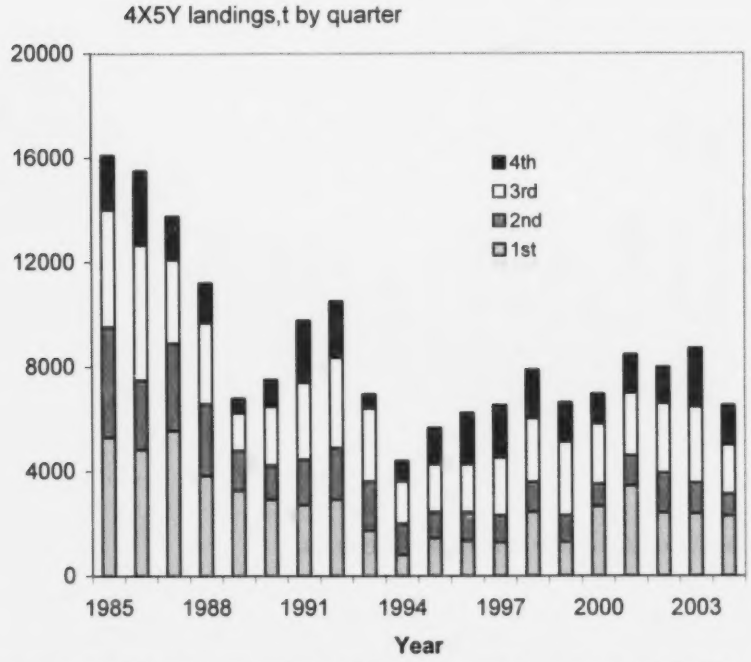
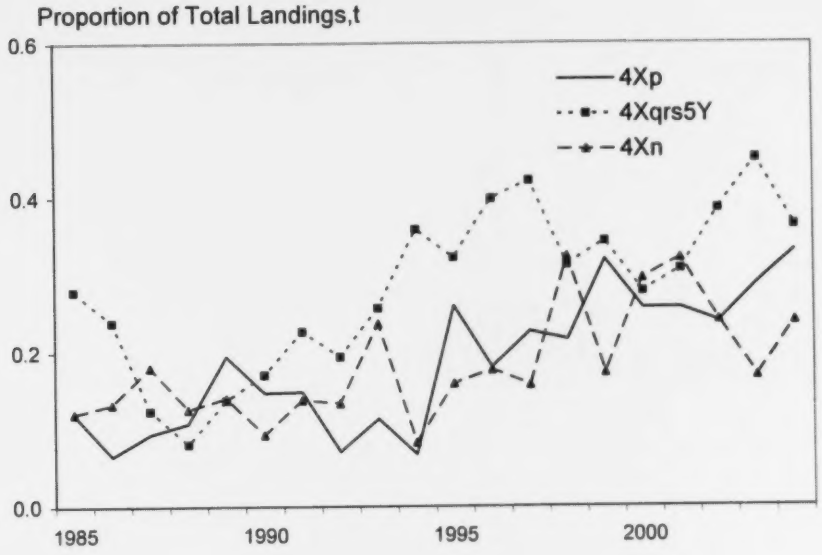


Figure 5. NAFO divisions 4X5Y haddock landings by quarter, 1985-2004.



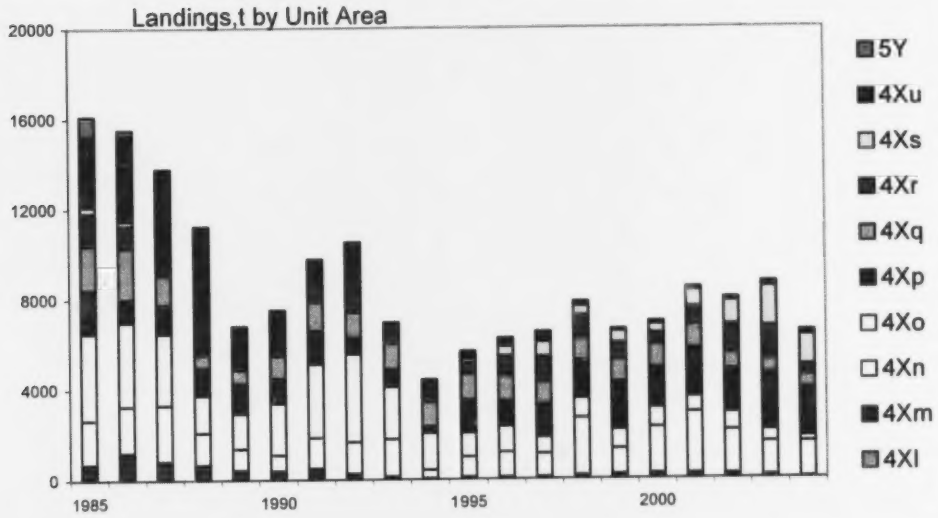


Figure 6. NAFO divisions 4X5Y haddock landings by unit area, 1985-2004.

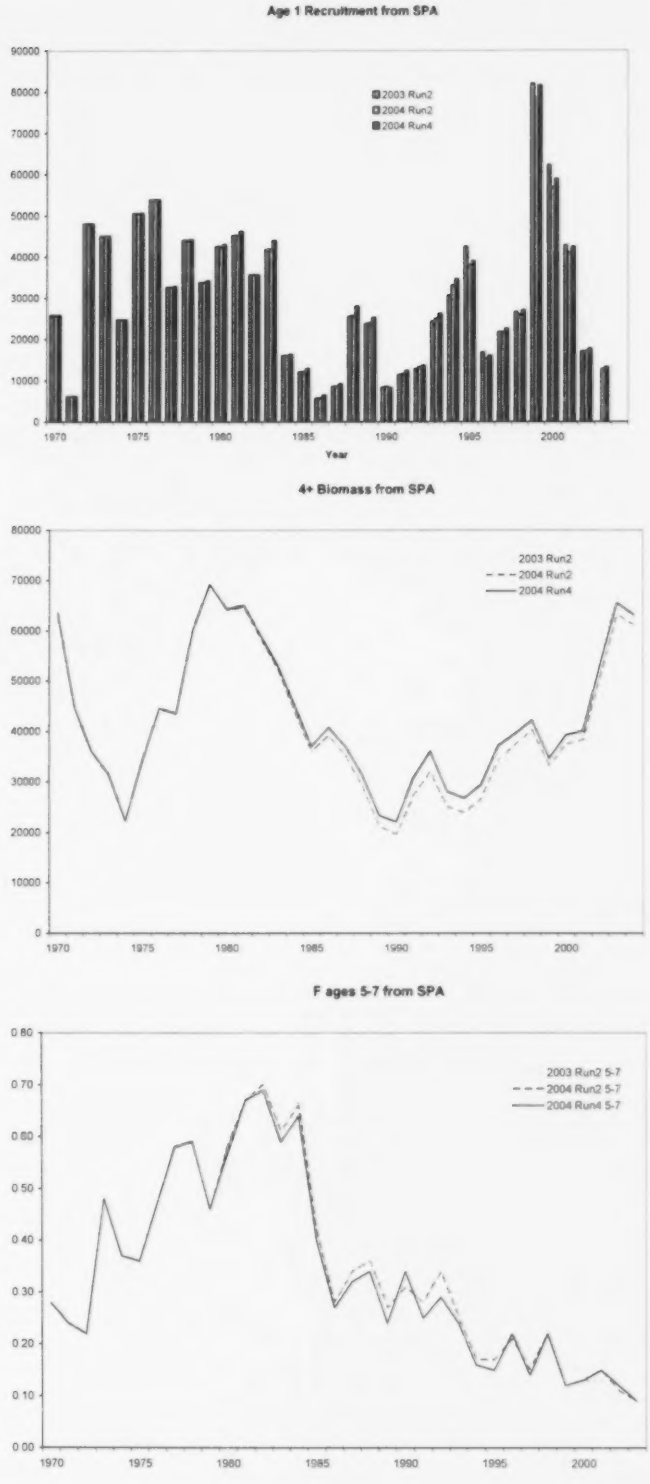
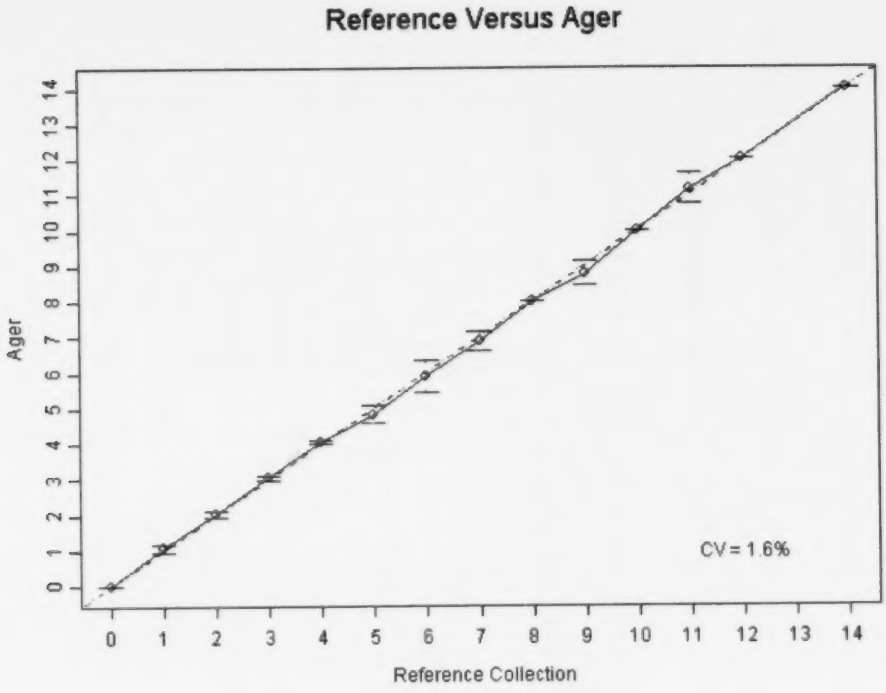


Figure 7. Comparison of SPA results for NAFO divisions 4X5Y haddock from 2003 assessment, same model with updated catch-at-age using seasonal a's and b's, and updated catch-at-age using annual a's and b's.



	Ager														
Reference Collection	0	1	2	3	4	5	6	7	8	9	10	11	12	14	Total
0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1	0	27	2	0	0	0	0	0	0	0	0	0	0	0	29
2	0	1	42	2	0	0	0	0	0	0	0	0	0	0	45
3	0	0	0	60	3	0	0	0	0	0	0	0	0	0	63
4	0	0	0	0	53	2	0	0	0	0	0	0	0	0	55
5	0	0	0	0	2	10	0	0	0	0	0	0	0	0	12
6	0	0	0	0	0	2	6	1	0	0	0	0	0	0	9
7	0	0	0	0	0	0	1	8	0	0	0	0	0	0	9
8	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4
9	0	0	0	0	0	0	0	0	2	7	0	0	0	0	9
10	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
11	0	0	0	0	0	0	0	0	0	0	0	5	1	0	6
12	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	3	28	44	62	58	14	7	9	6	7	2	5	2	1	248

Figure 8. Comparison of primary ager against reference collection in August 2005.

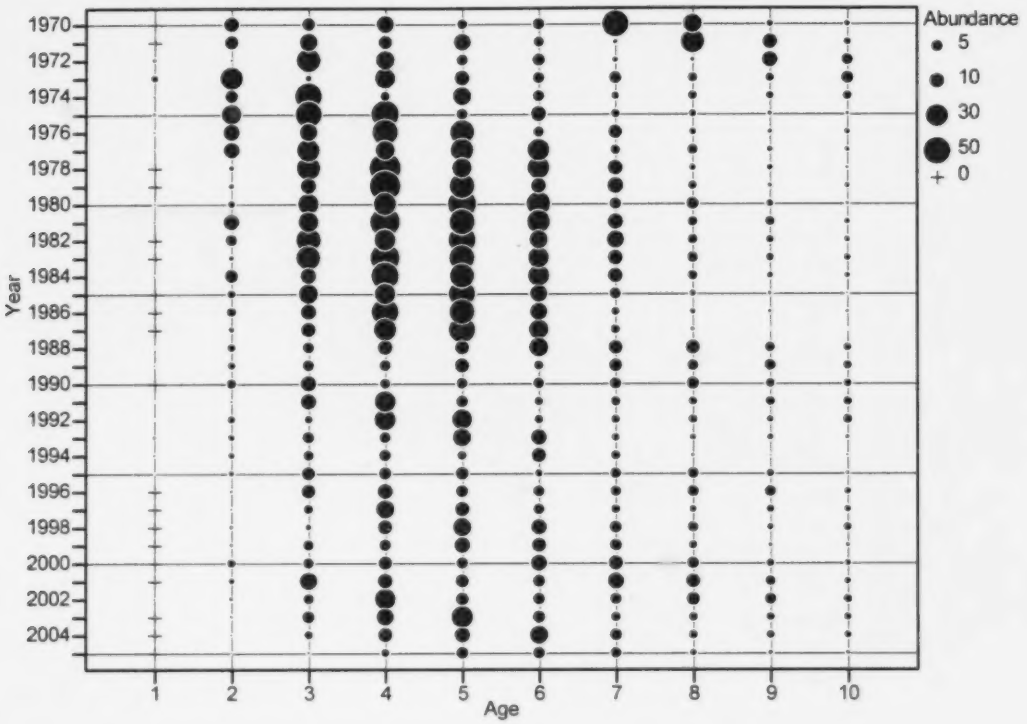
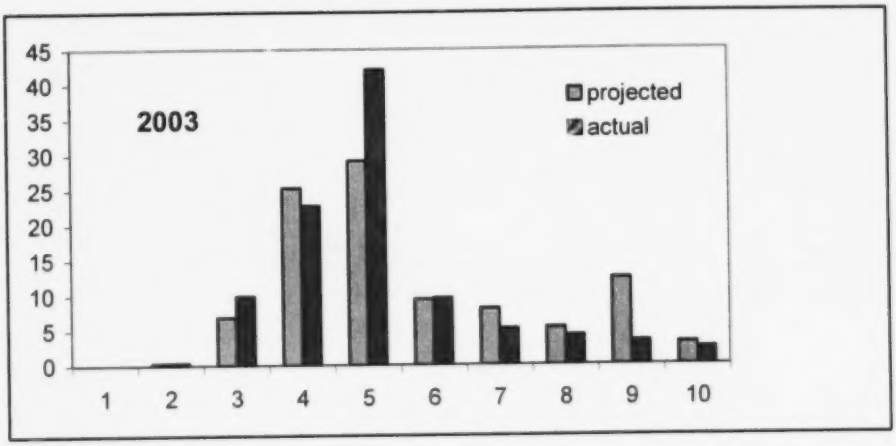
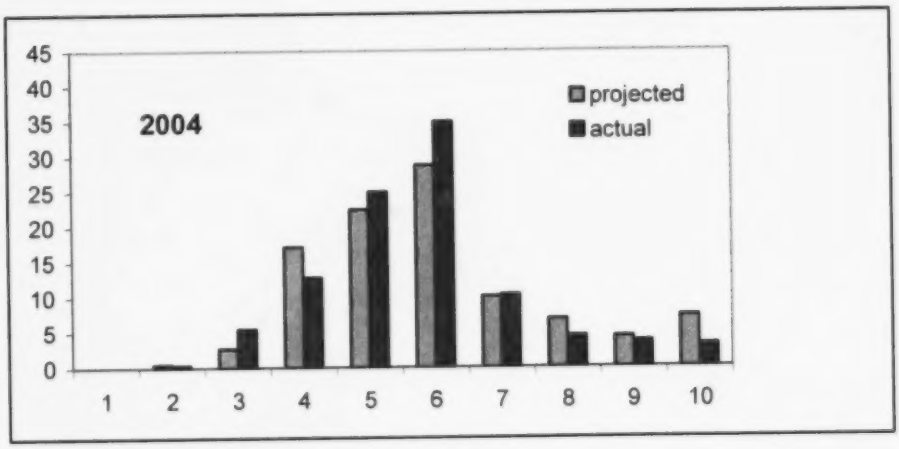


Figure 9. Recent trends in commercial catch-at-age.





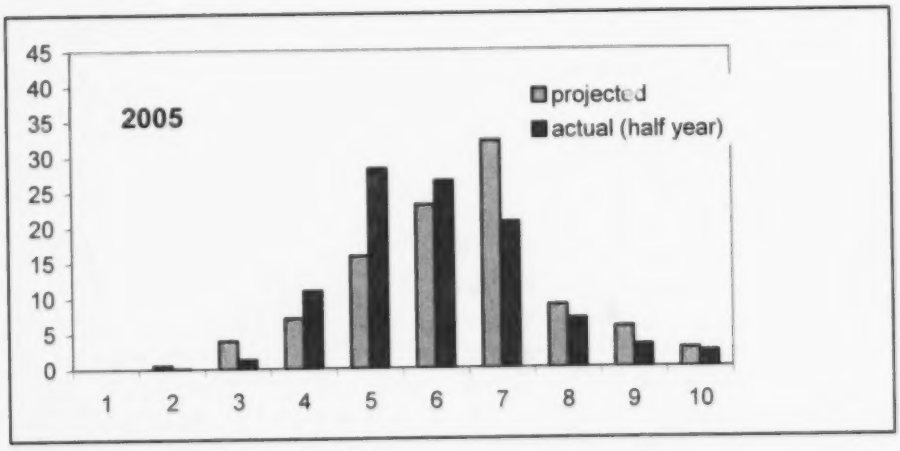


Figure 10. Comparison of age composition (%) of projected and actual catch-at-age.

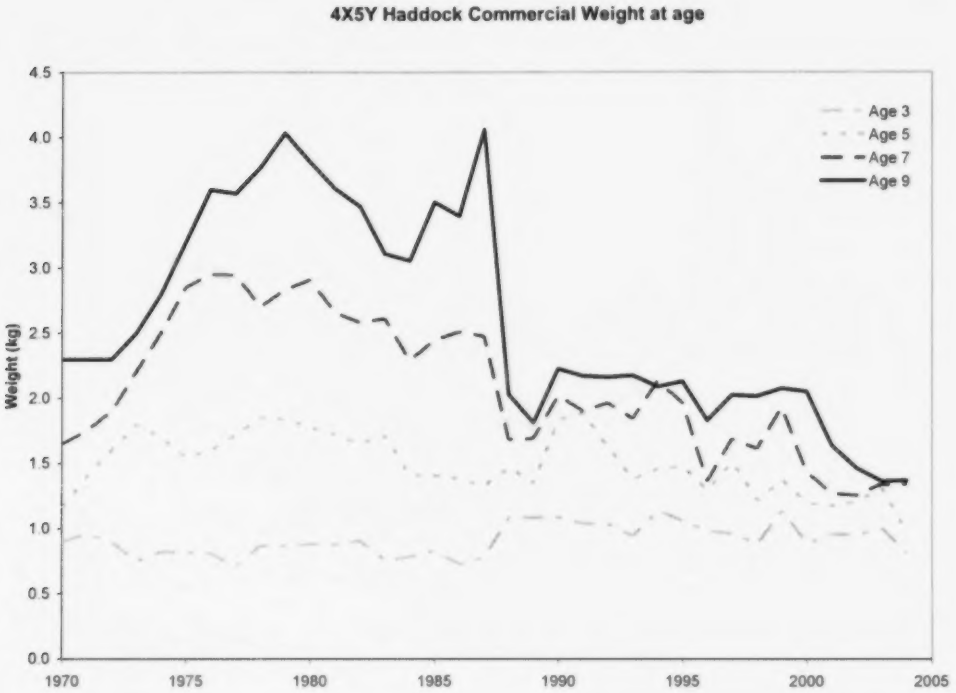


Figure 11. NAFO divisions 4X5Y haddock commercial mean weight-at-age (kg).

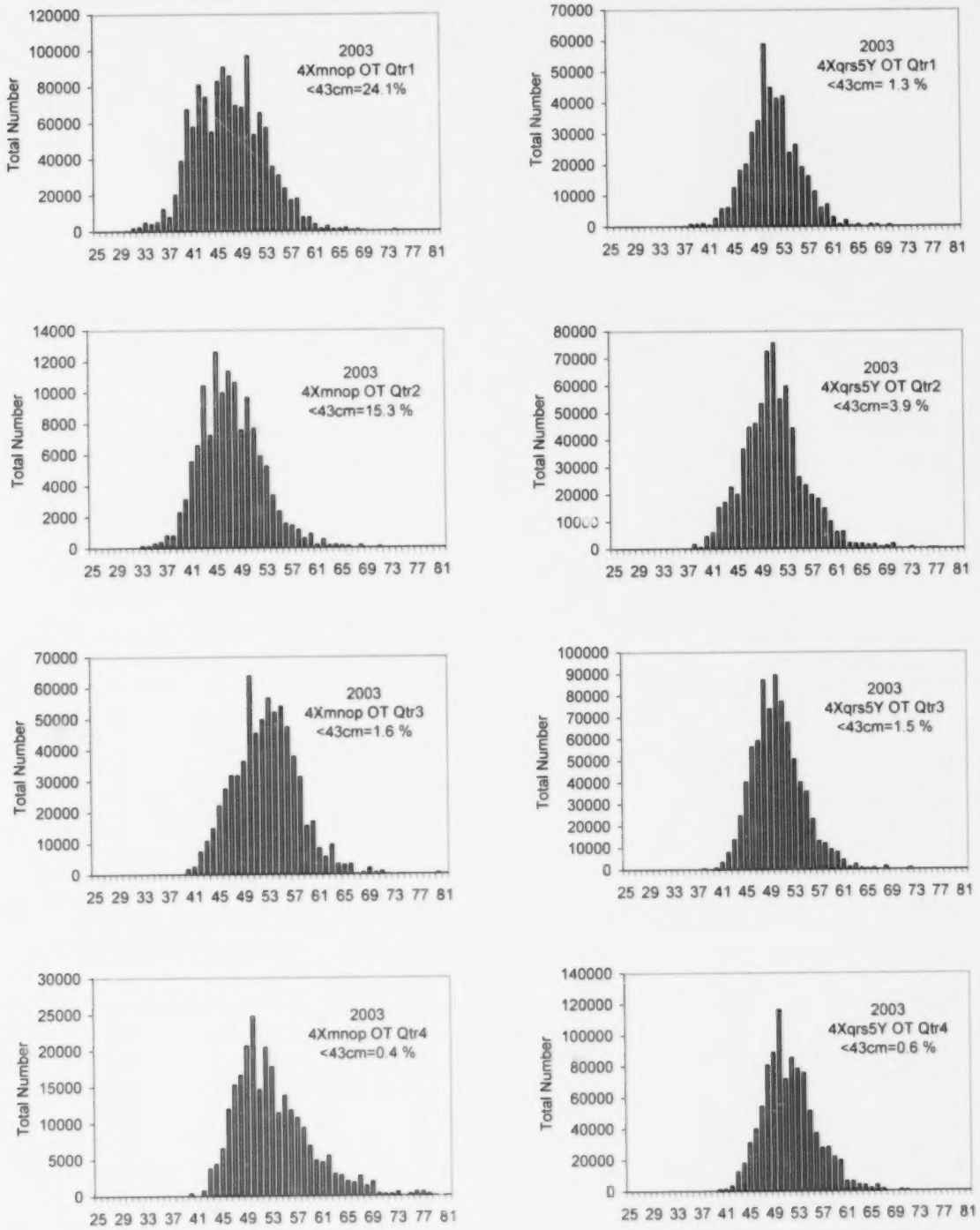
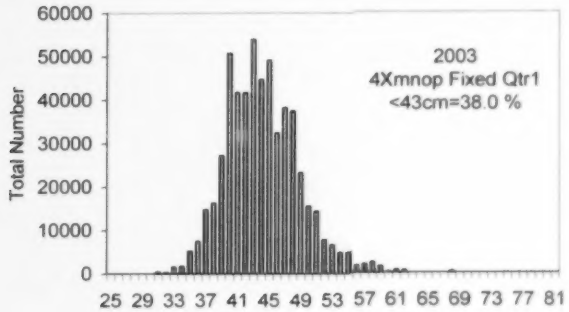
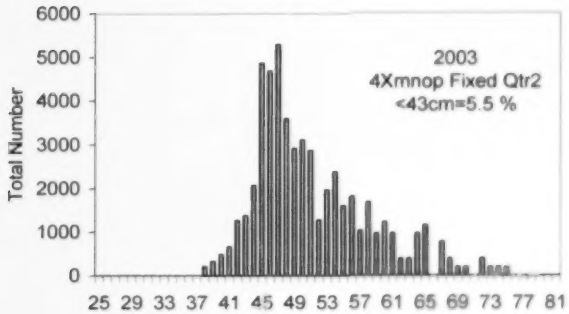
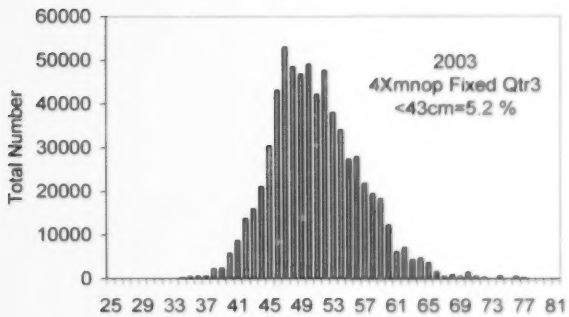


Figure 12a. Length composition of haddock caught by mobile gear in NAFO divisions 4X5Y in 2003. Samples are all by otter trawlers.







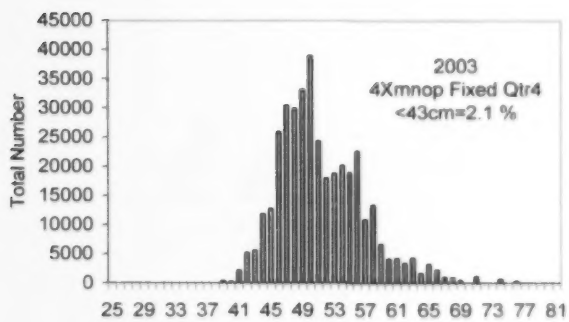


Figure 12b. Length composition of haddock caught by fixed gear in NAFO divisions 4X5Y in 2003. Samples are by longliners.

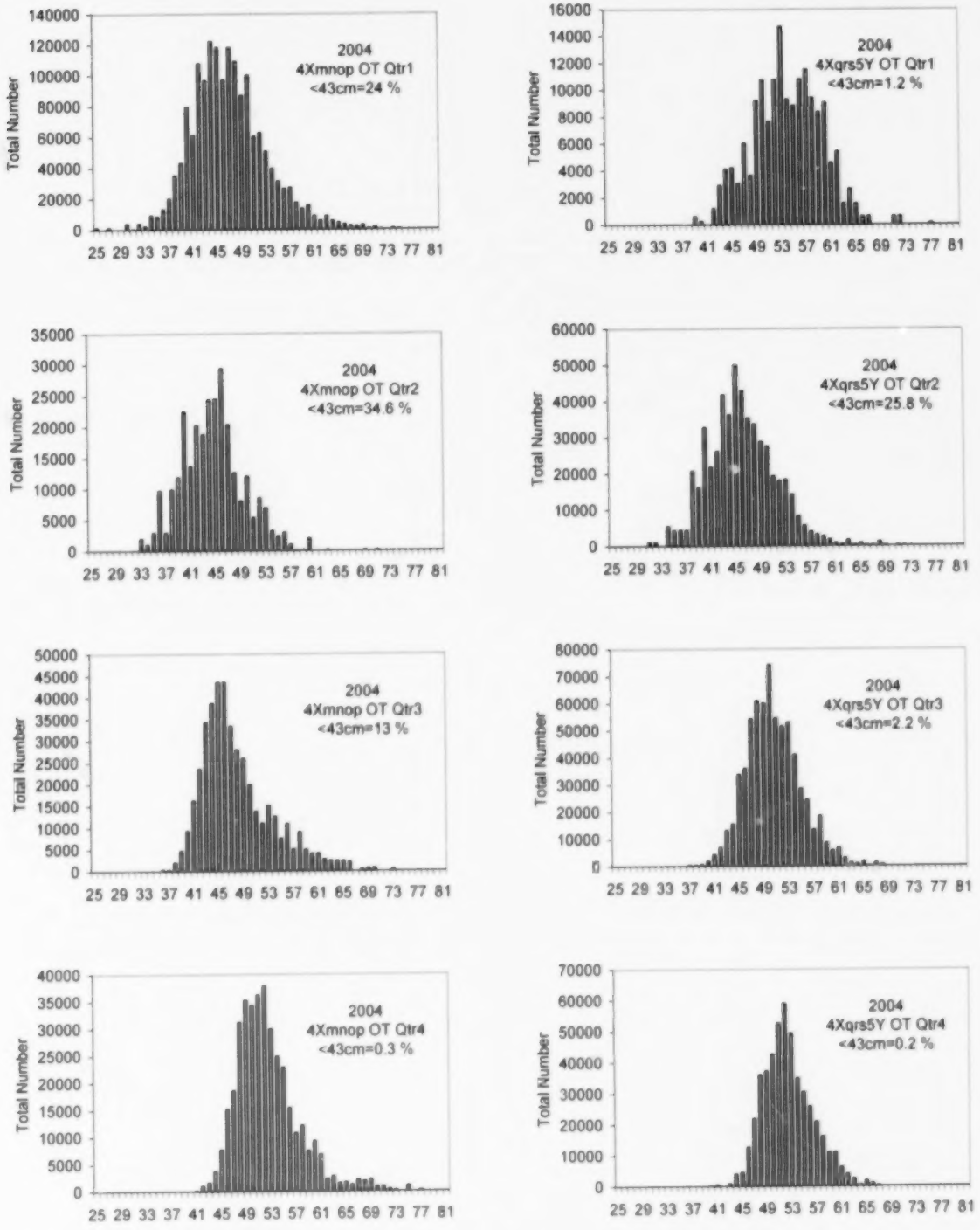


Figure 13a. Length composition of haddock caught by mobile gear in NAFO divisions 4X5Y in 2004. Samples are all by otter trawlers.

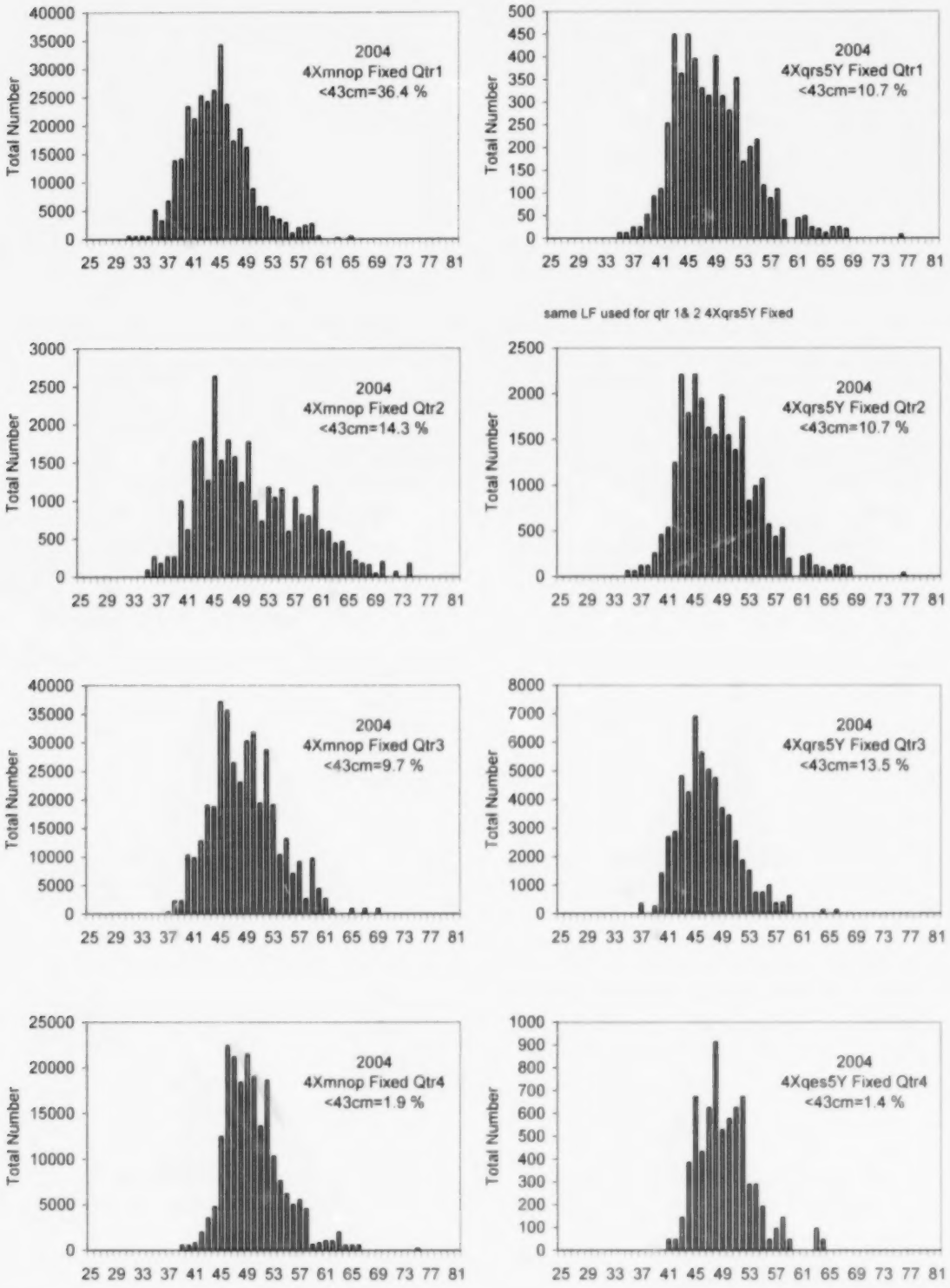


Figure 13b. Length composition of haddock caught by fixed gear in NAFO divisions 4X5Y in 2004. Samples are by longliners with one gillnet sample in 4Xp.

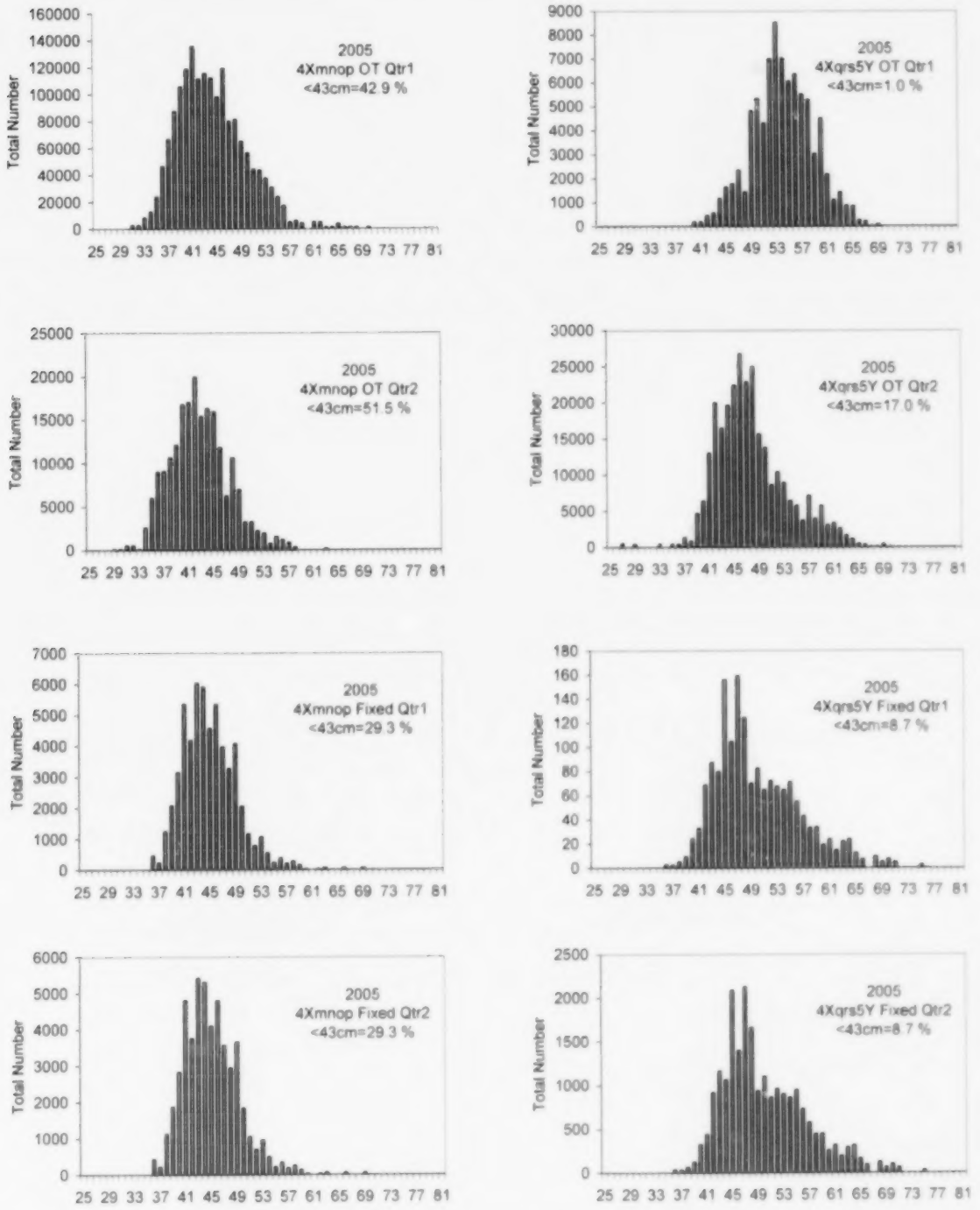


Figure 14. Length composition of haddock caught at length by otter trawls and longliners in NAFO divisions 4X5Y in 2005.

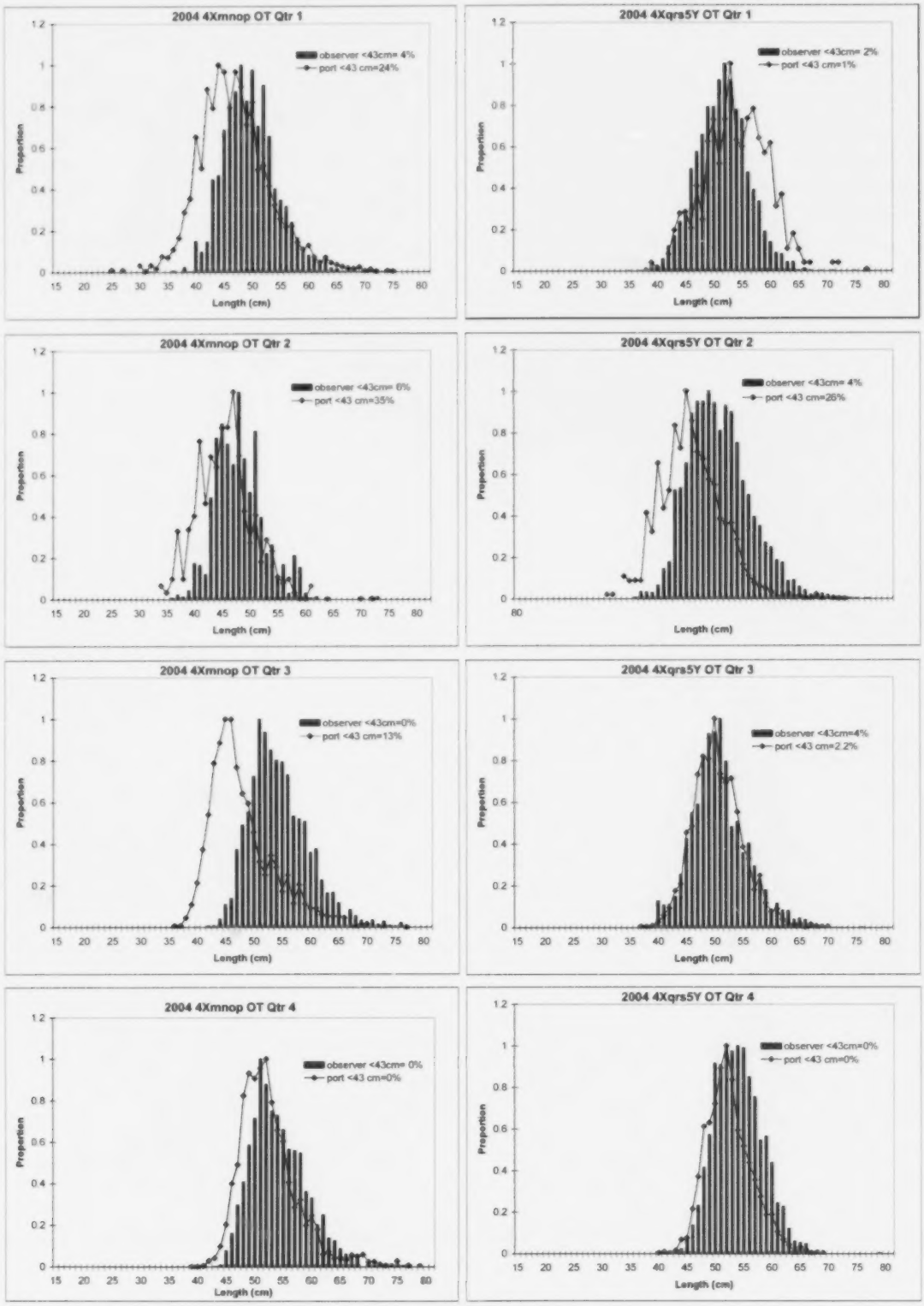


Figure 15a. Length composition of haddock caught by otter trawls from port samples and observer samples in NAFO divisions 4X5Y in 2004, by quarter and area.

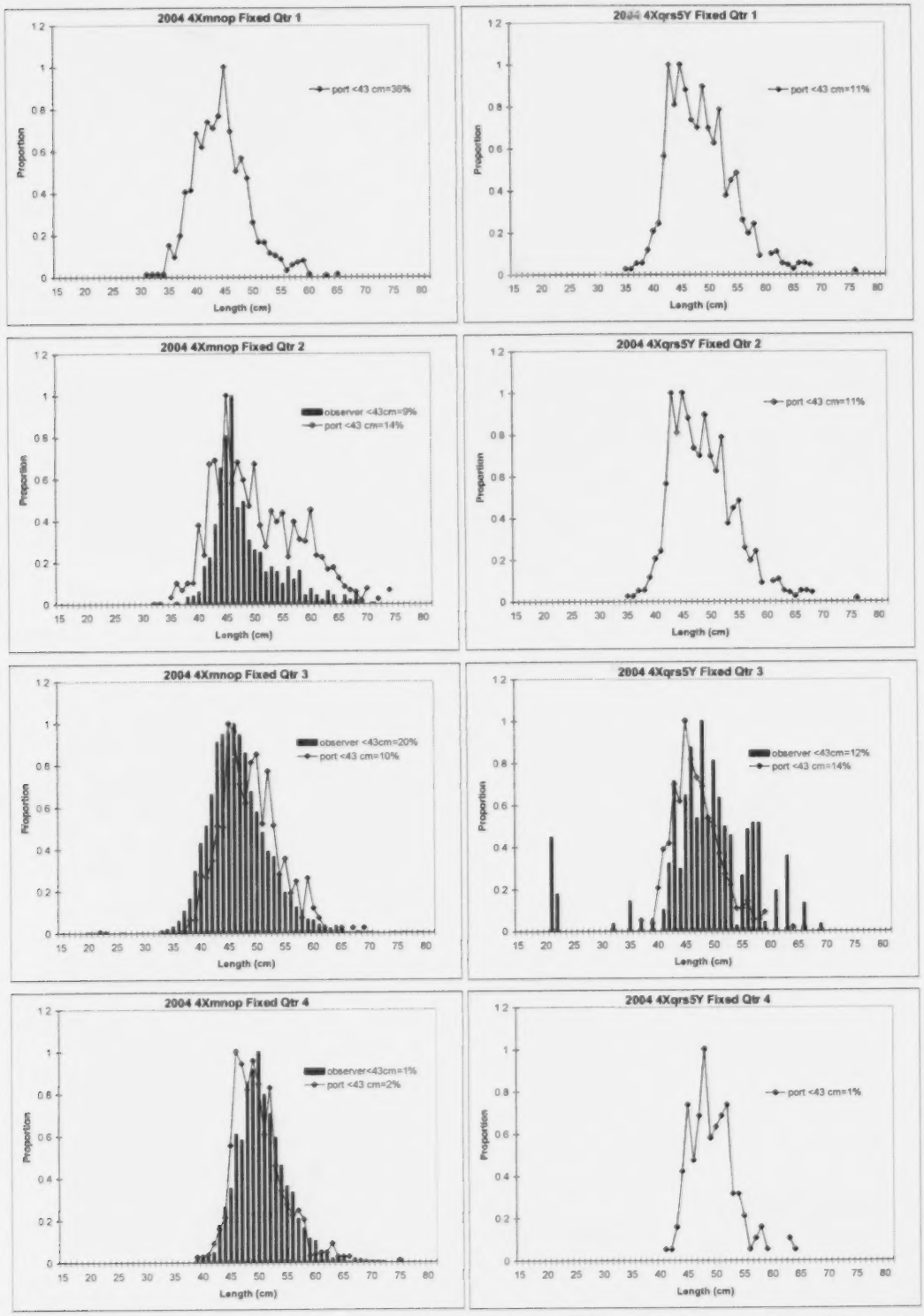


Figure 15b. Length composition of haddock caught by fixed gear from port samples and observer samples in NAFO divisions 4X5Y in 2004, by quarter and area.

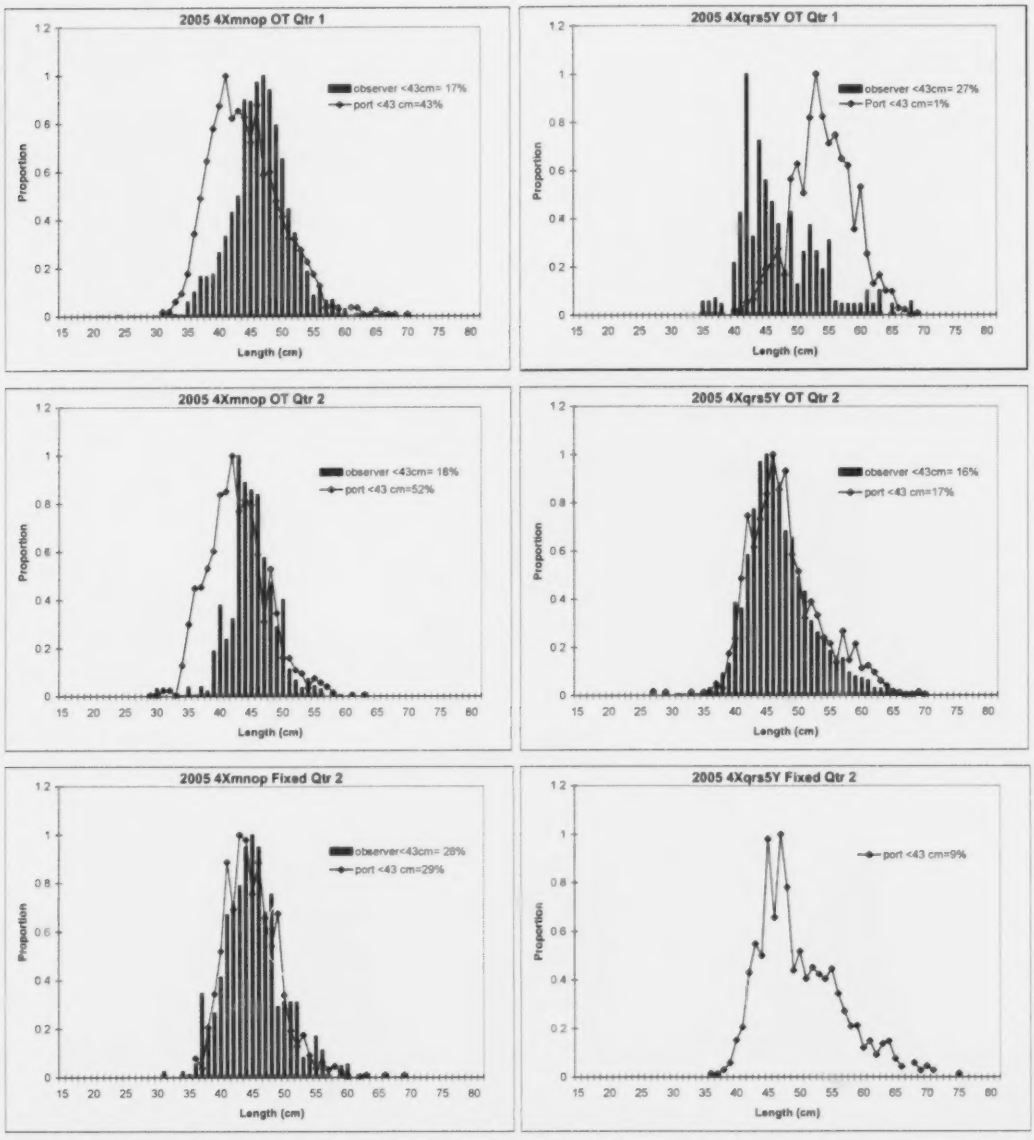


Figure 16. Length composition of haddock from port samples and observer samples in NAFO divisions 4X5Y in 2005, by quarter and area.

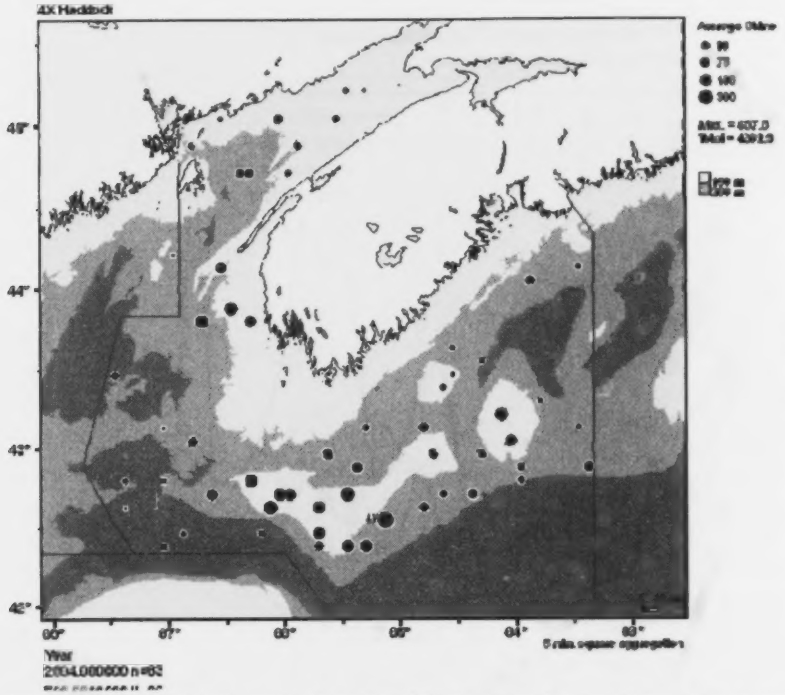


Figure 17a. 4X Haddock catch from the 2004 research vessel summer survey.

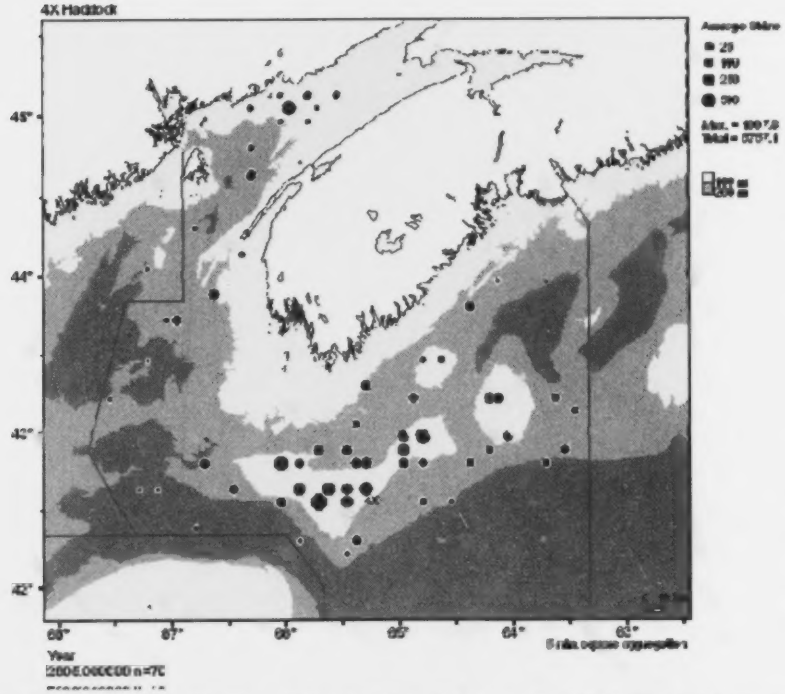


Figure 17b. NAFO Division 4X haddock catch from the 2005 research vessel summer survey.

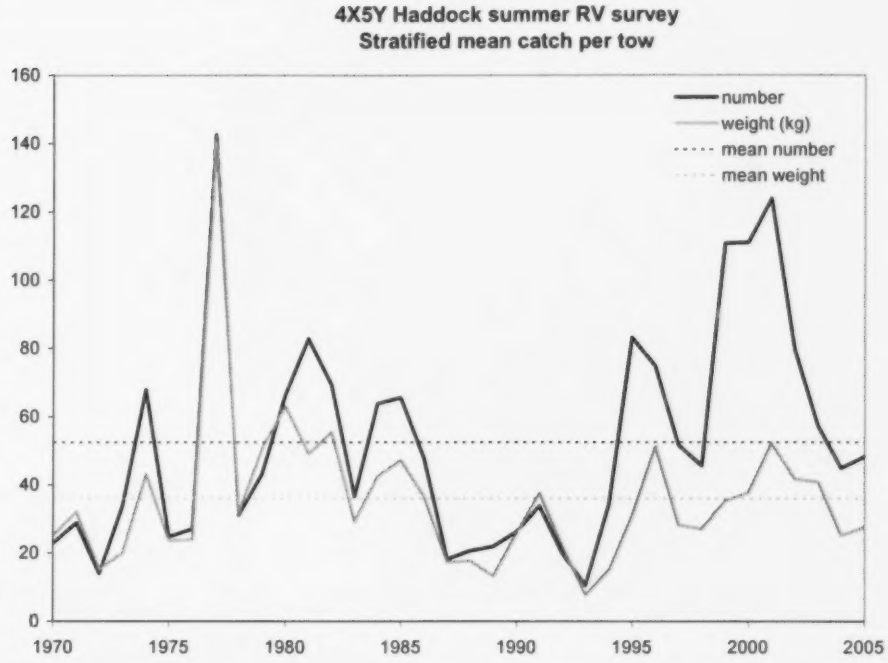


Figure 18. Summer research vessel survey stratified mean catch per tow stratas 470-495.

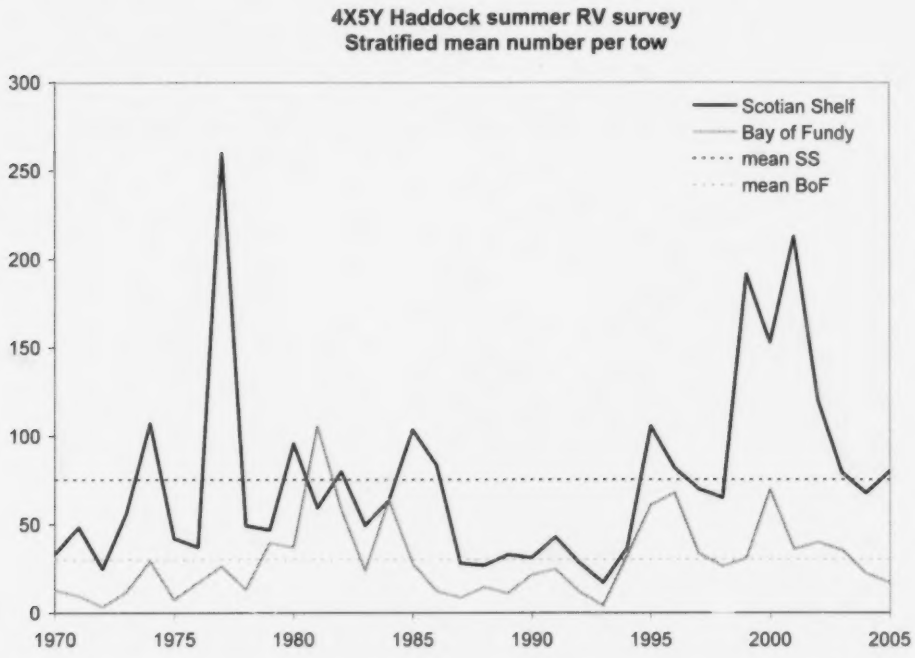


Figure 19a. Summer research vessel survey stratified mean number per tow, by area.

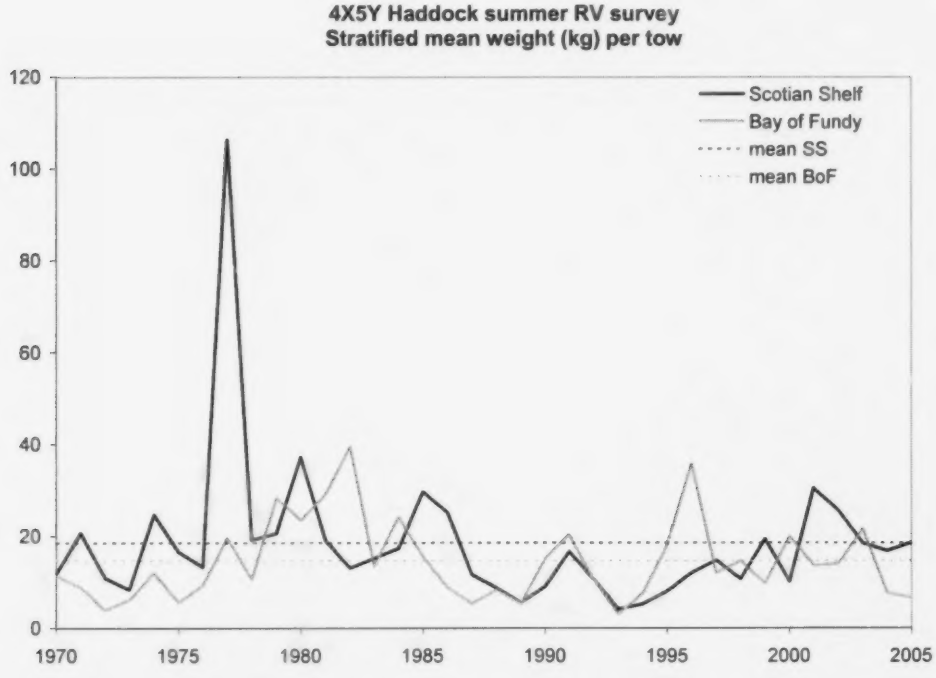


Figure 19b. Summer research vessel survey stratified mean weight per tow, by area.

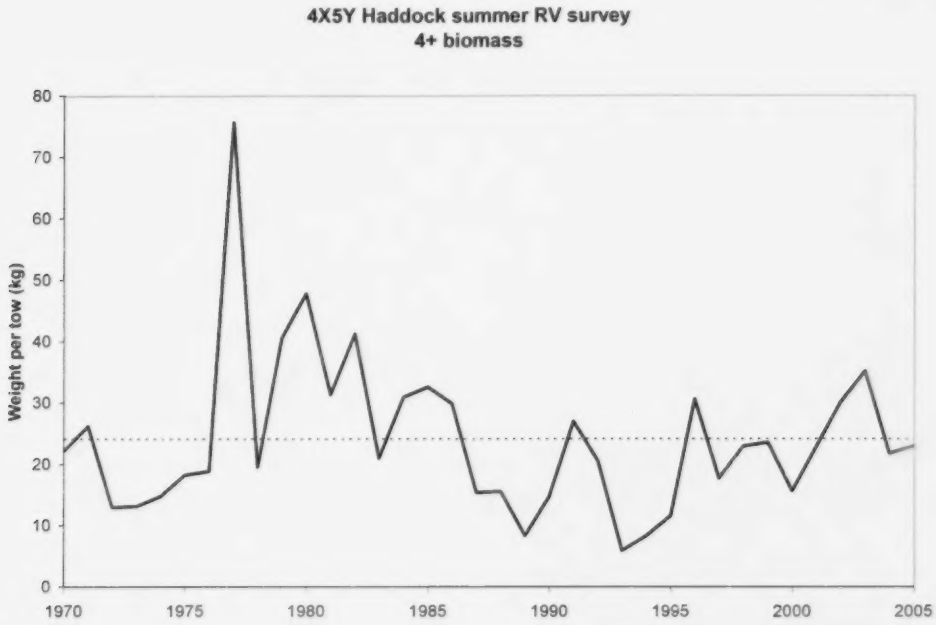


Figure 20a. Summer research vessel survey 4+ biomass trend, stratas 470-495.

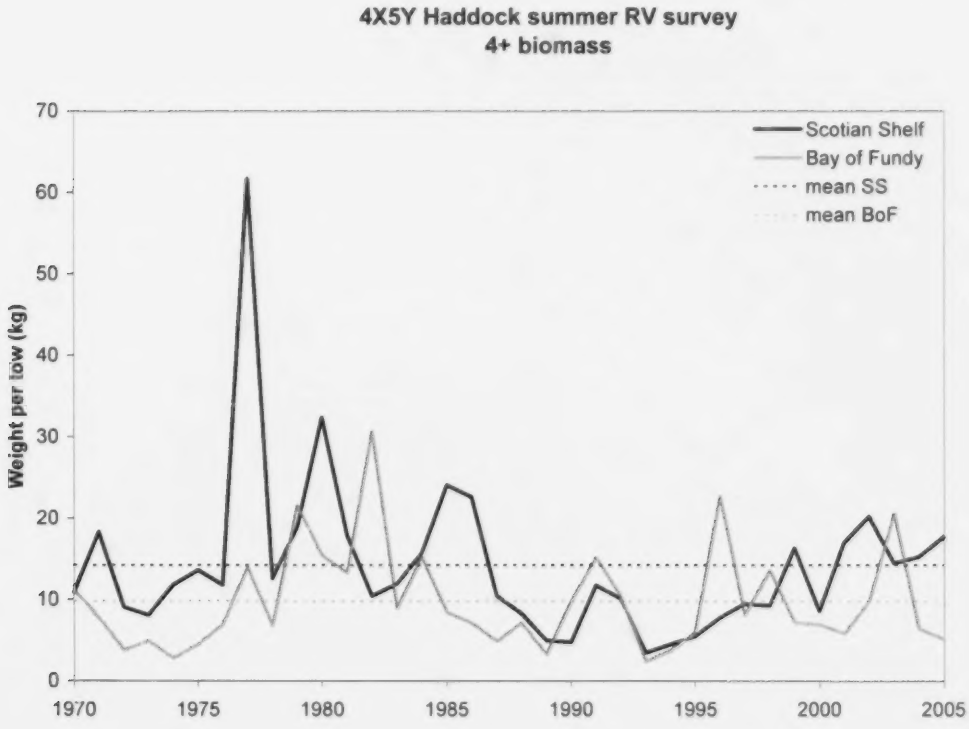


Figure 20b. Summer research vessel survey 4+ biomass trend, by area.

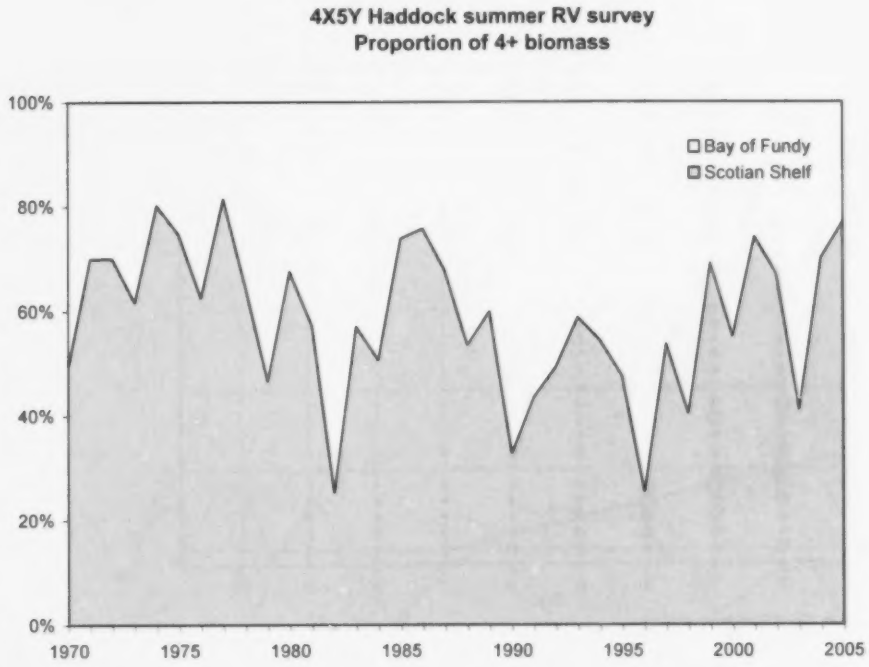


Figure 21. Summer research vessel survey 4+ biomass trend, proportion by area.

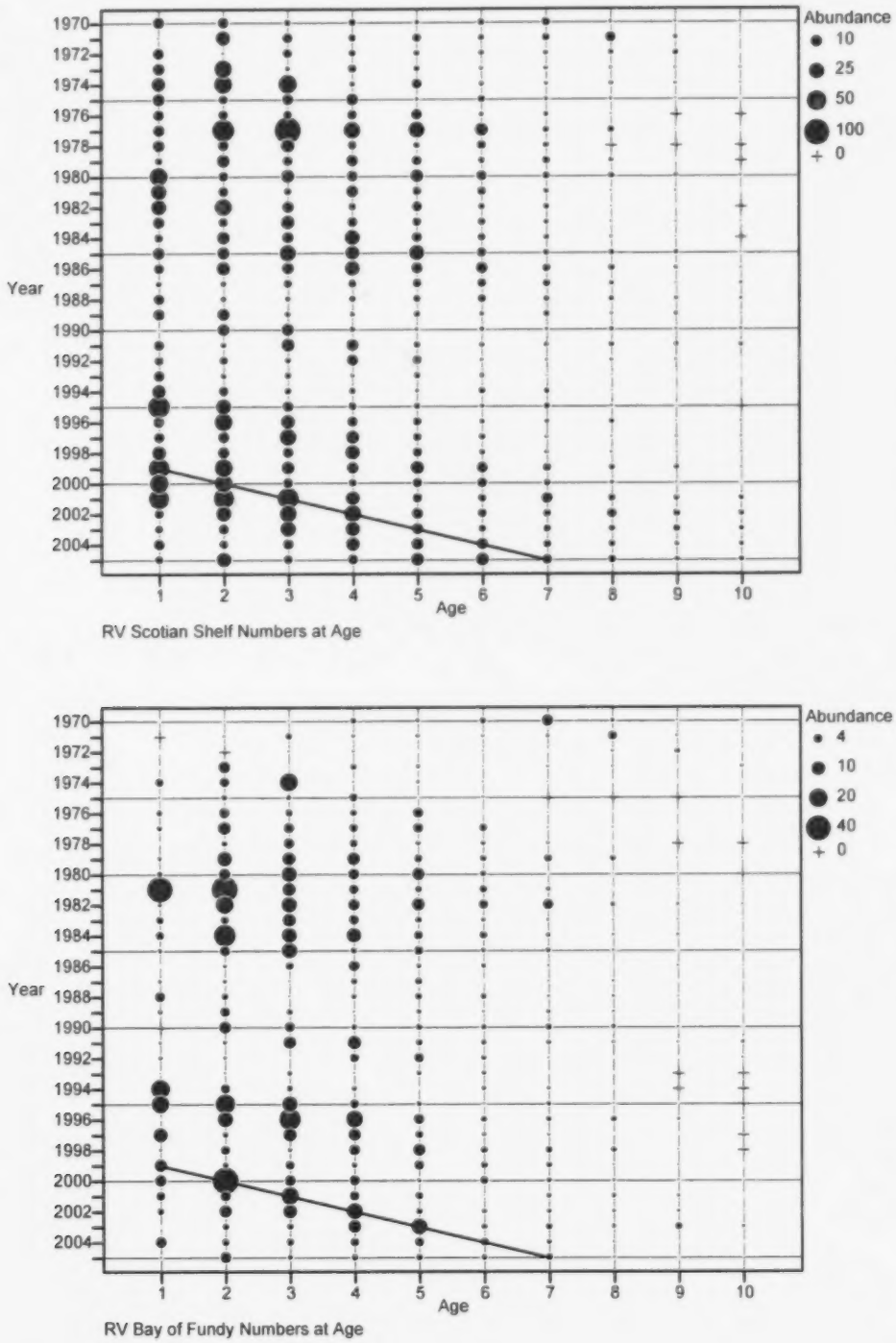
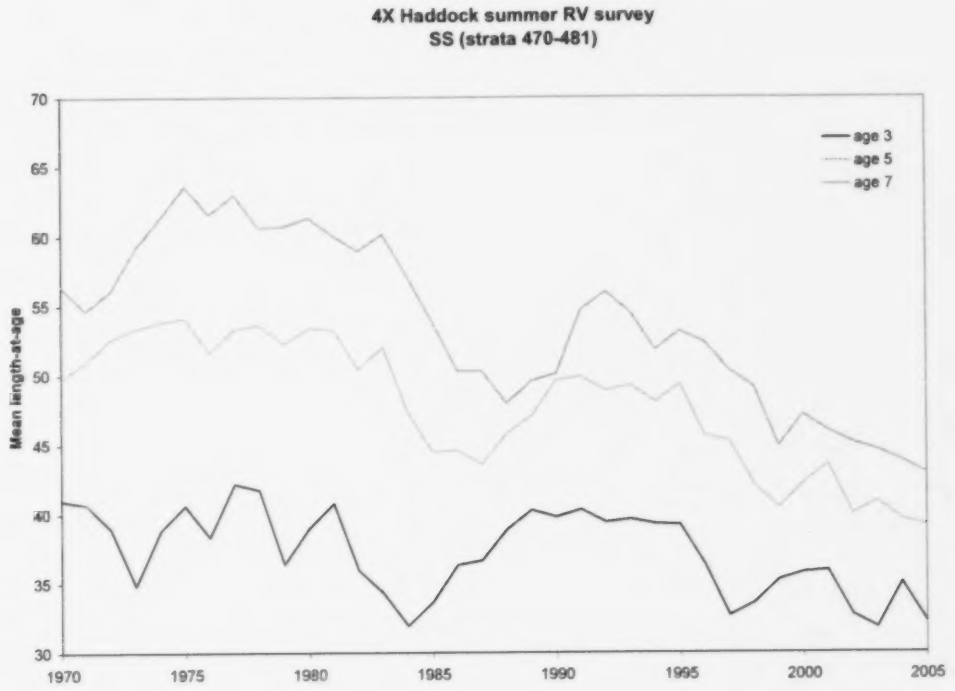


Figure 22. Age composition of summer research vessel survey indices, by area (Scotian Shelf on top, Bay of Fundy on bottom,) for NAFO divisions 4X5Y haddock. Solid line tracks 1998 yearclass.



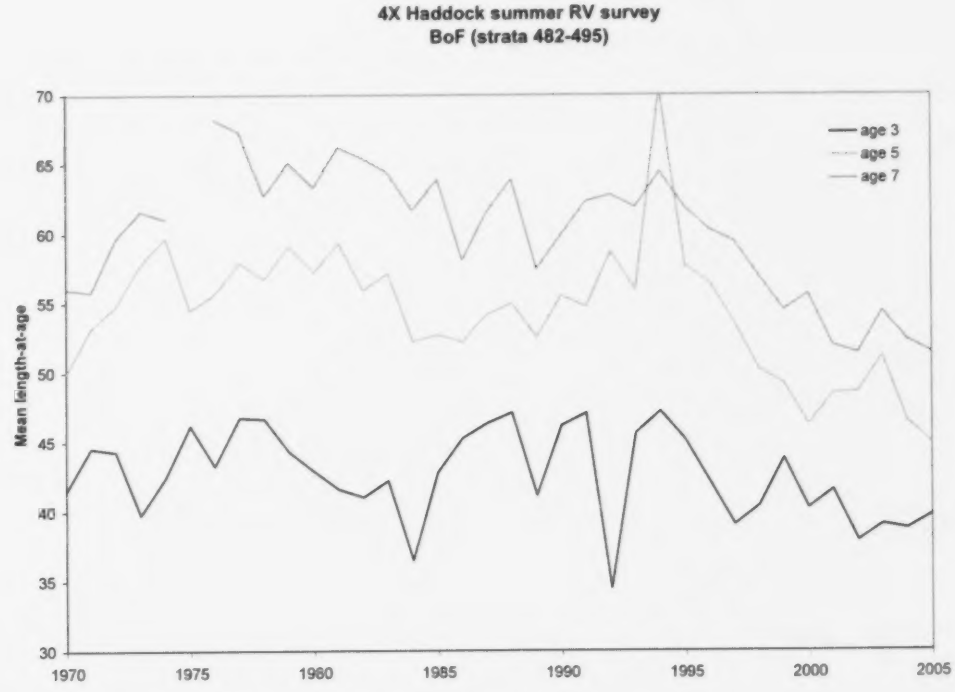
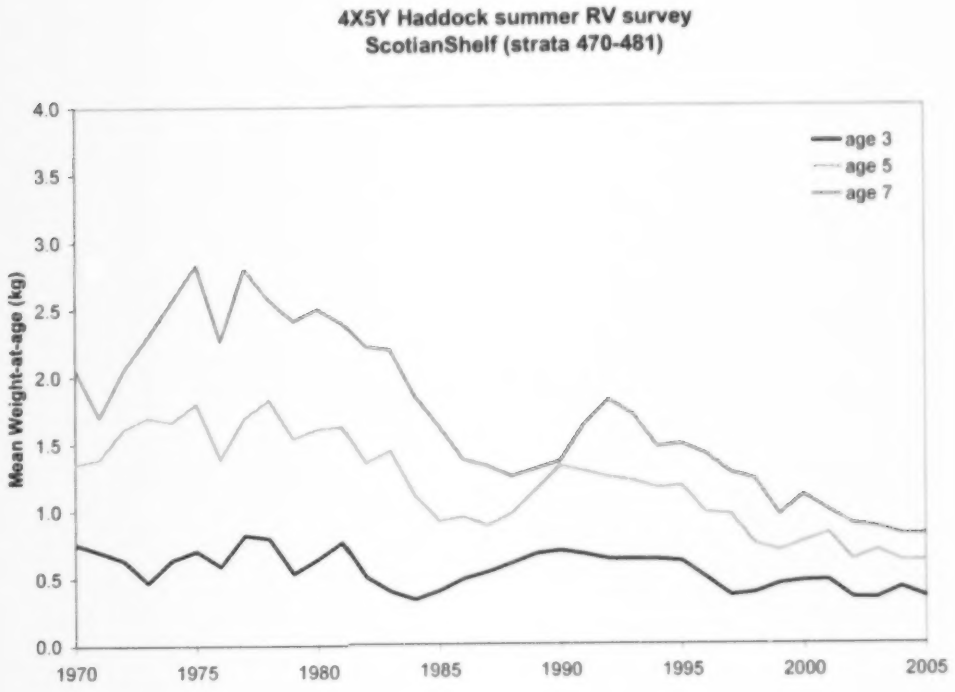


Figure 23. Summer research vessel survey mean length-at-age, by area.



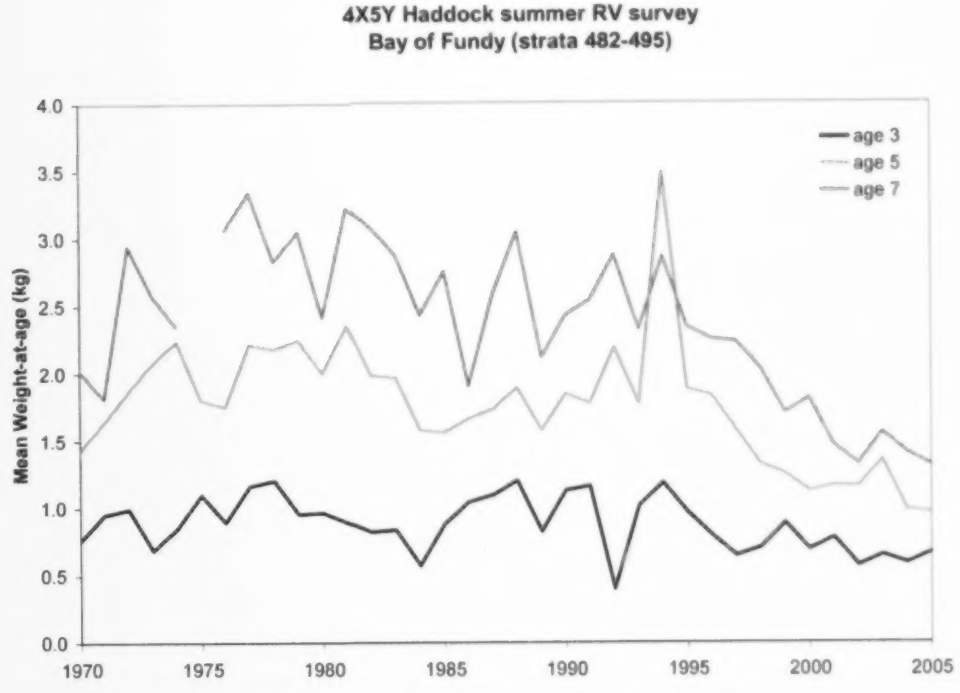


Figure 24. Summer research vessel survey mean weight-at-age, by area.

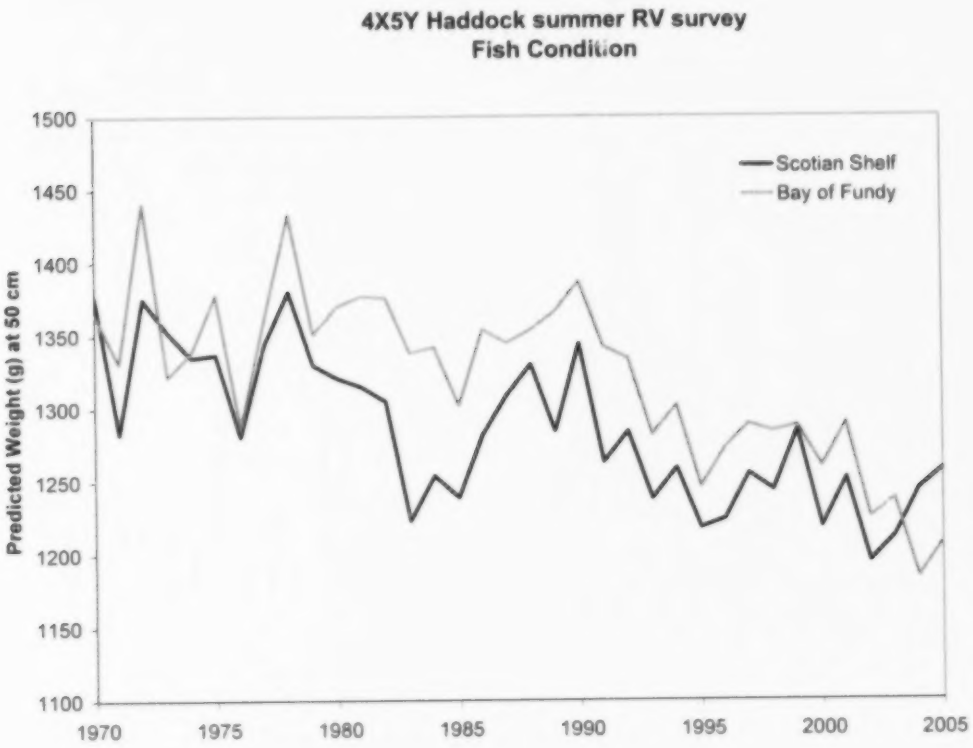


Figure 25. Summer research vessel survey condition index, predicted weight at 50cm.

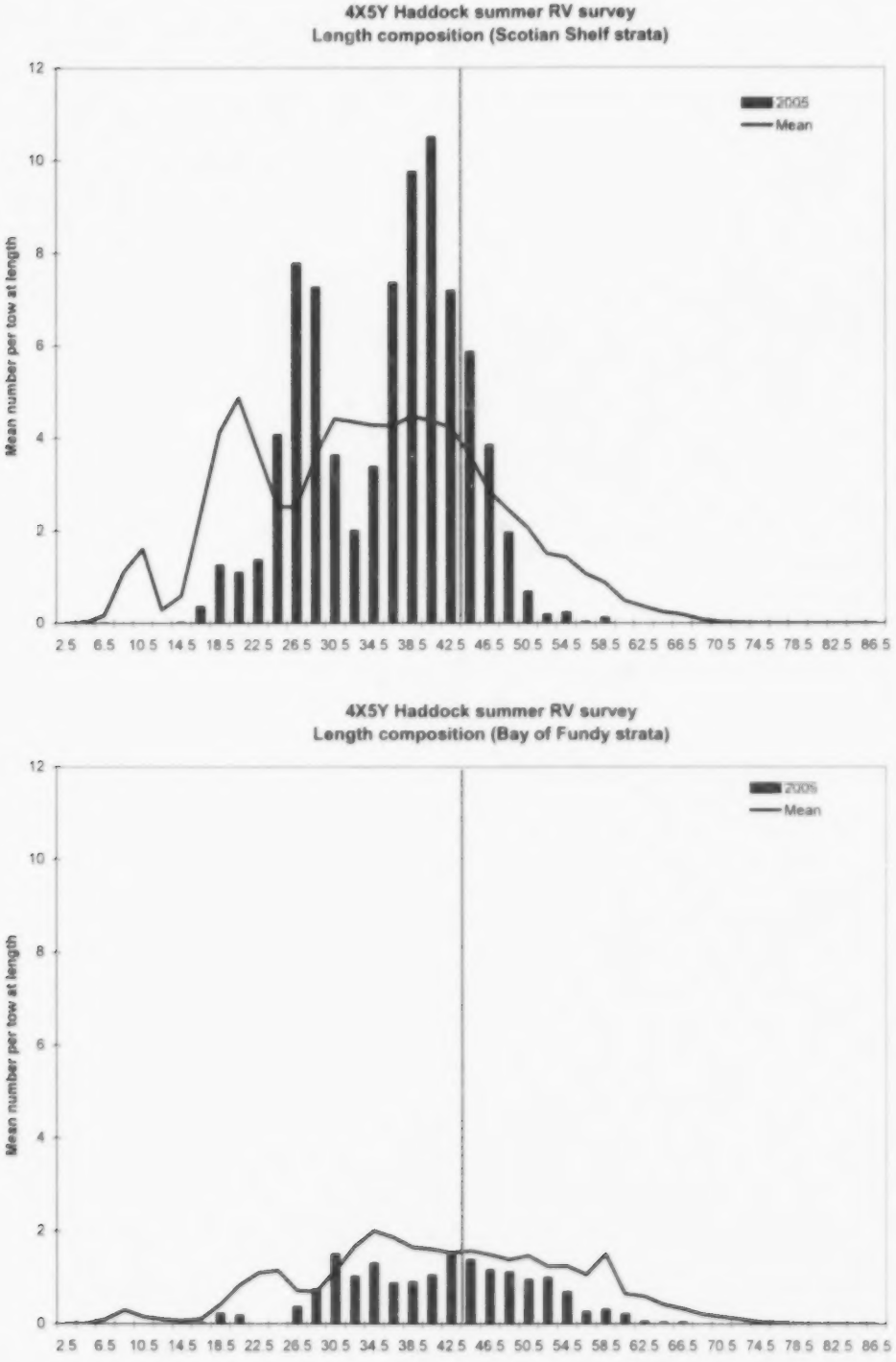
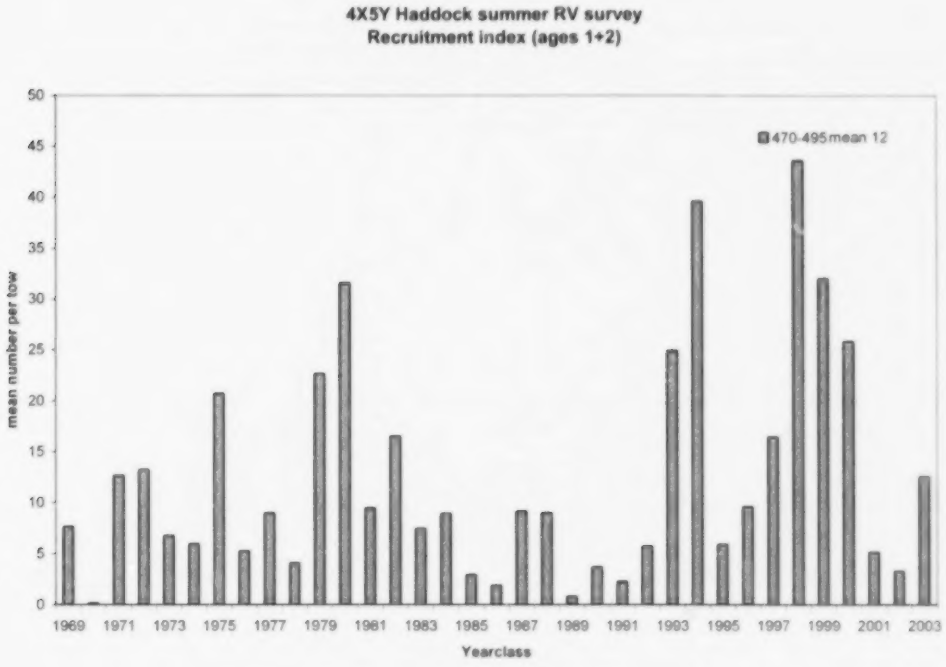


Figure 26. Summer research vessel survey 2005 size composition, compared to long-term mean, by area (vertical line is 43cm).



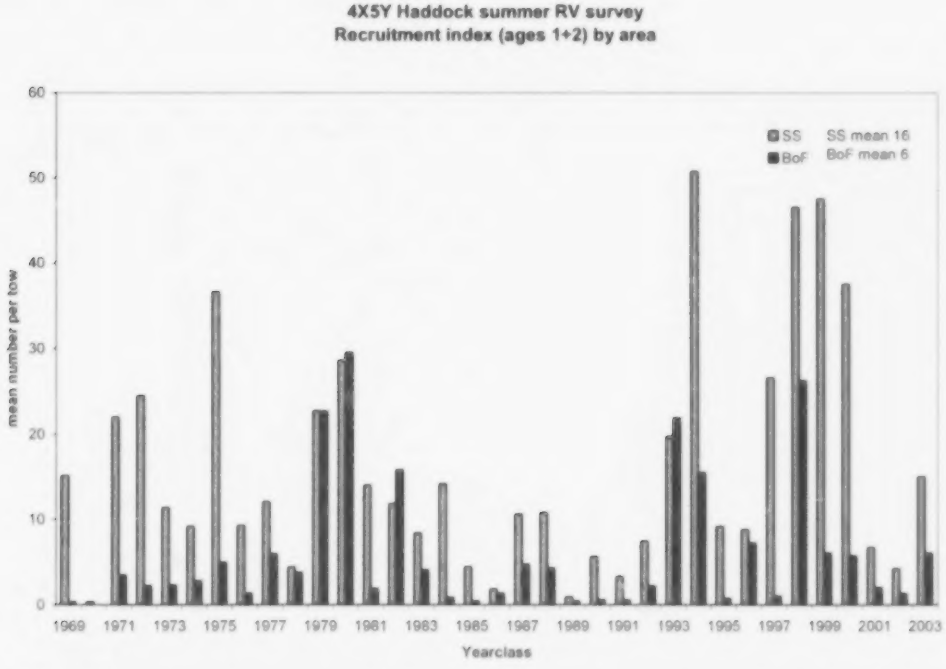


Figure 27. Recruitment indices from the summer research vessel survey for all NAFO Division 4X strata (upper) and Scotian Shelf and Bay of Fundy strata (lower).

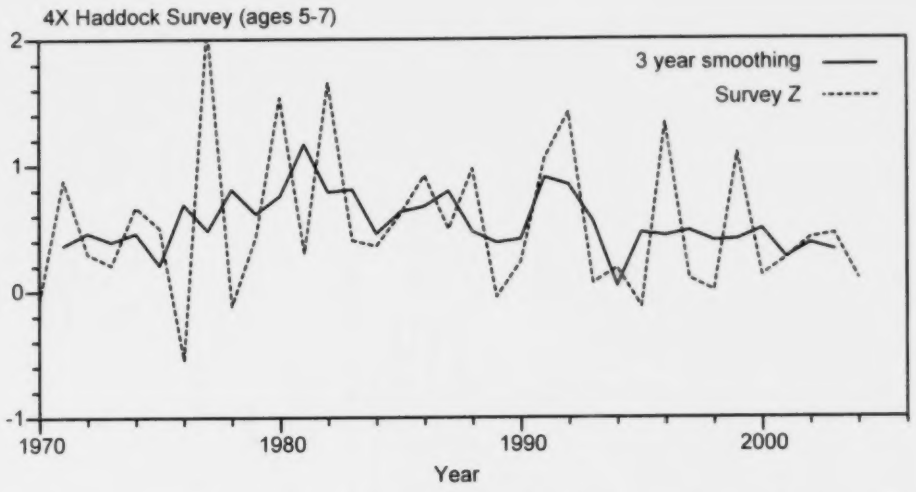


Figure 28. Total mortality (Z) for ages 5-7 calculated from the research vessel survey.

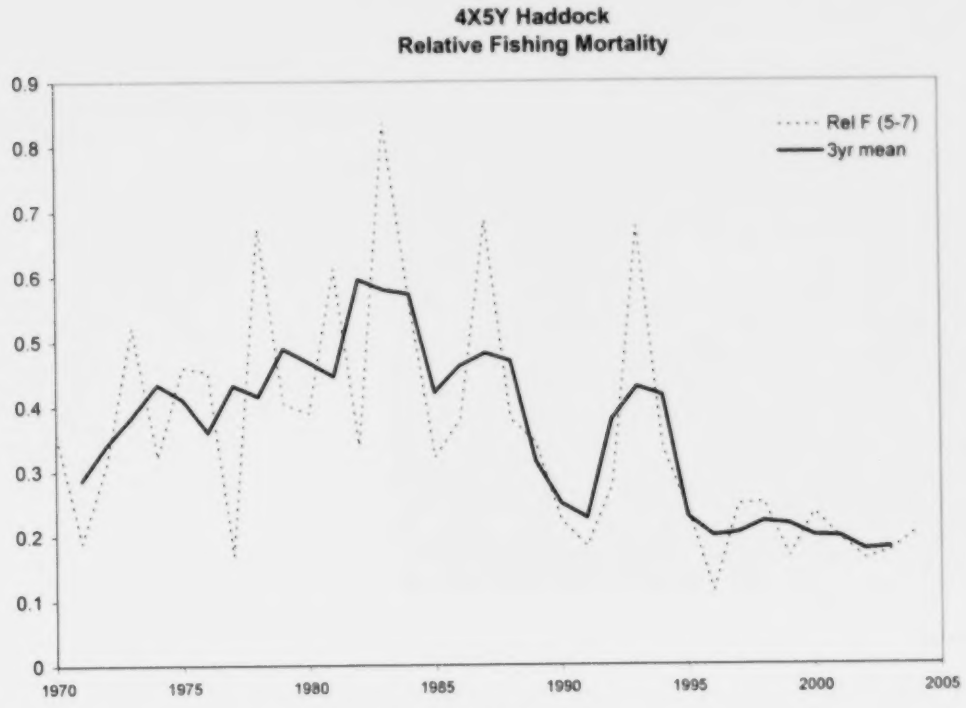


Figure 29a. Relative fishing mortality for ages 5-7.

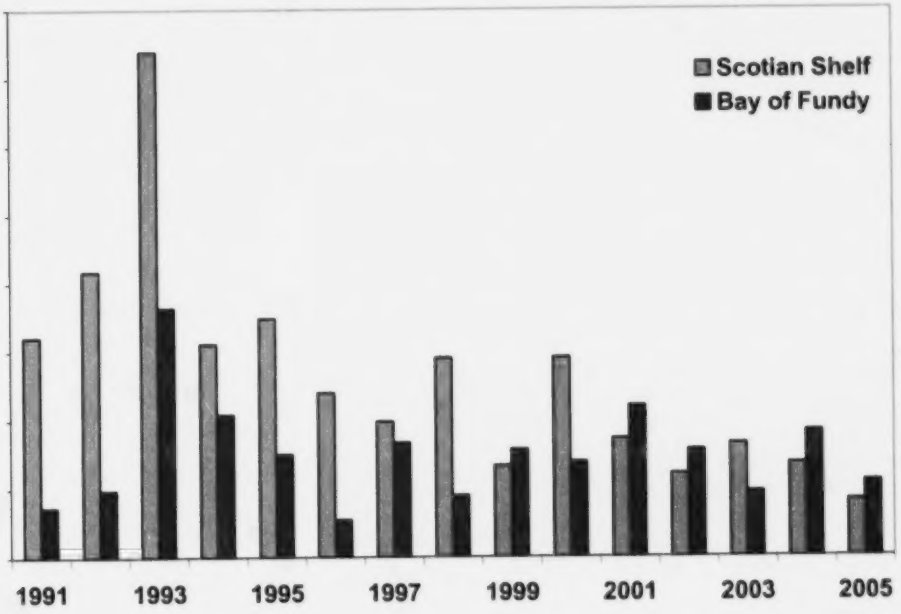


Figure 29b. Relative fishing mortality by area in recent years for NAFO divisions 4X5Y haddock.

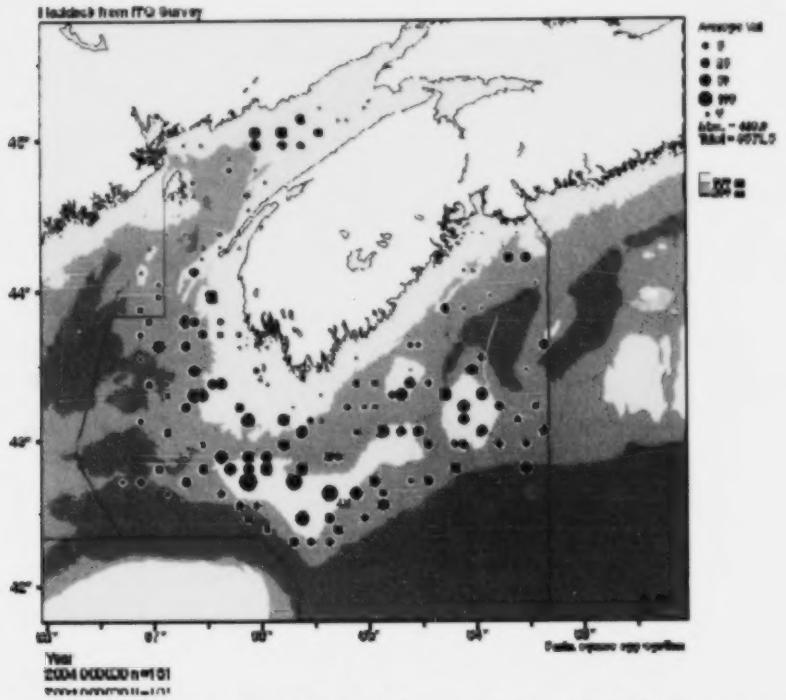


Figure 30a. NAFO divisions 4X5Y haddock catch from the 2004 ITQ survey

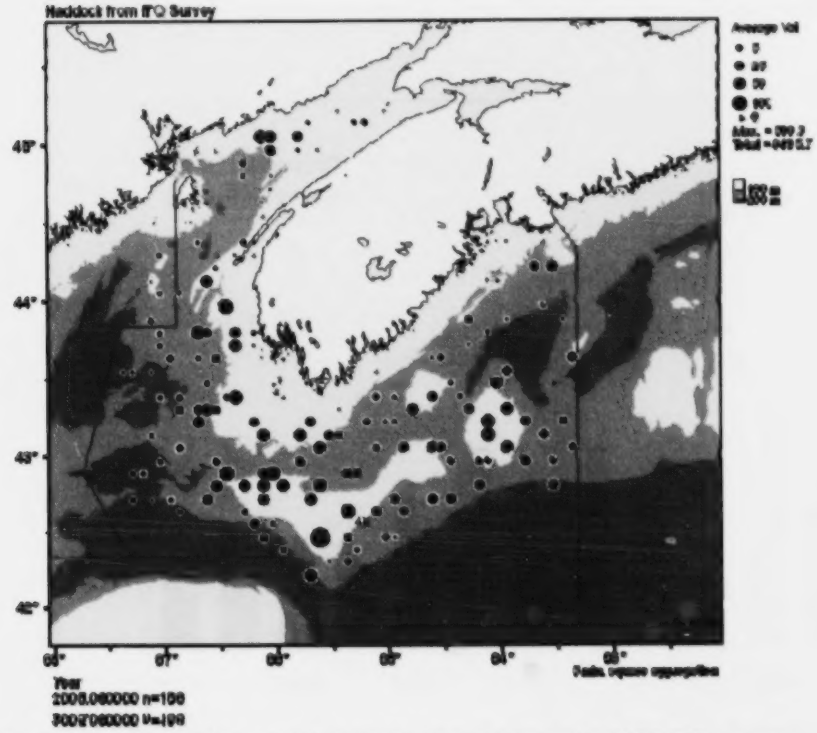


Figure 30b. NAFO divisions 4X5Y haddock catch from the 2005 ITQ survey.

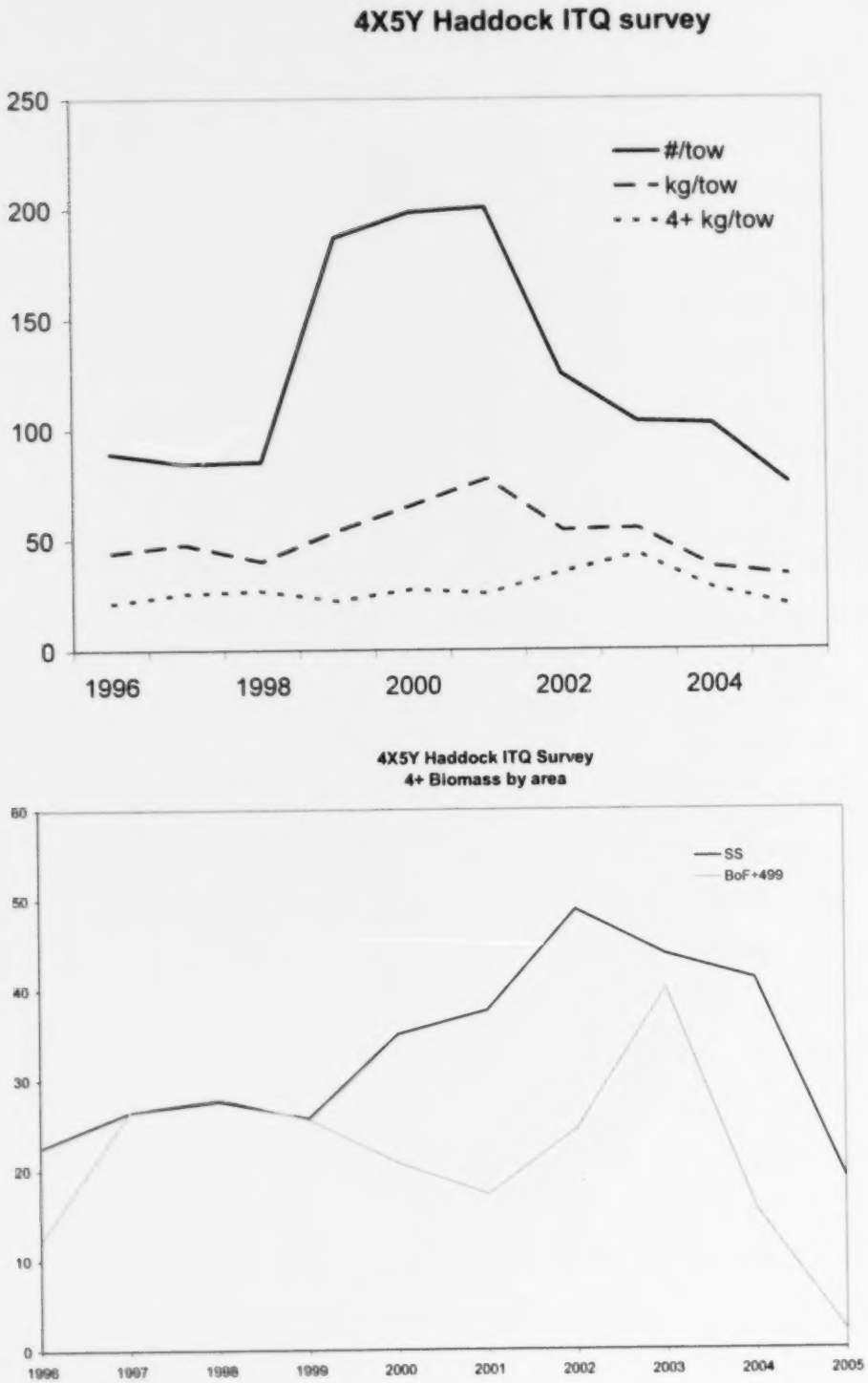
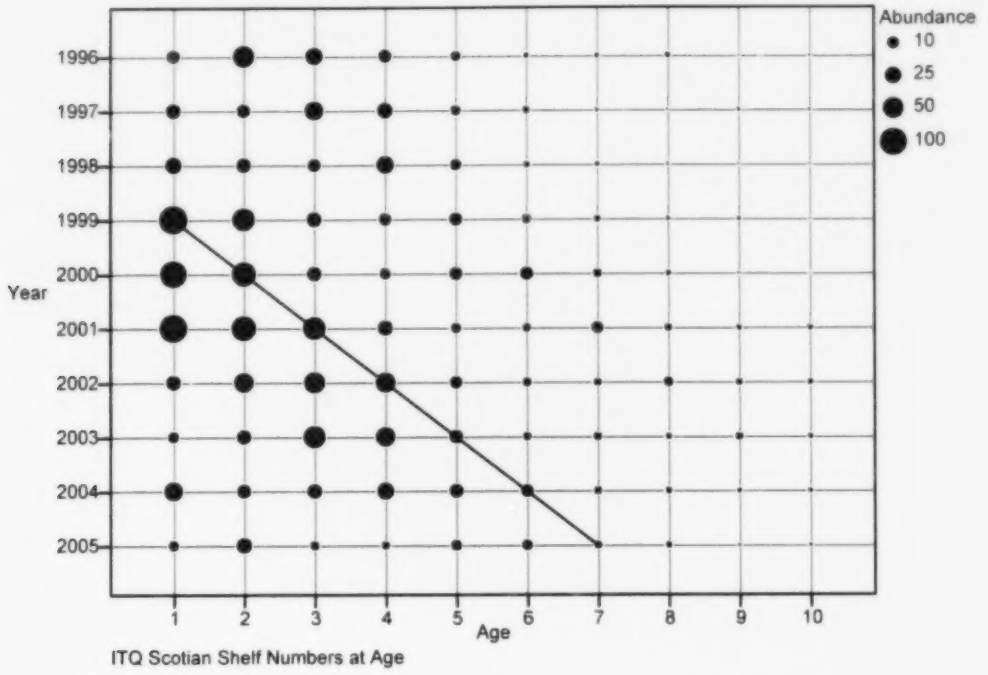
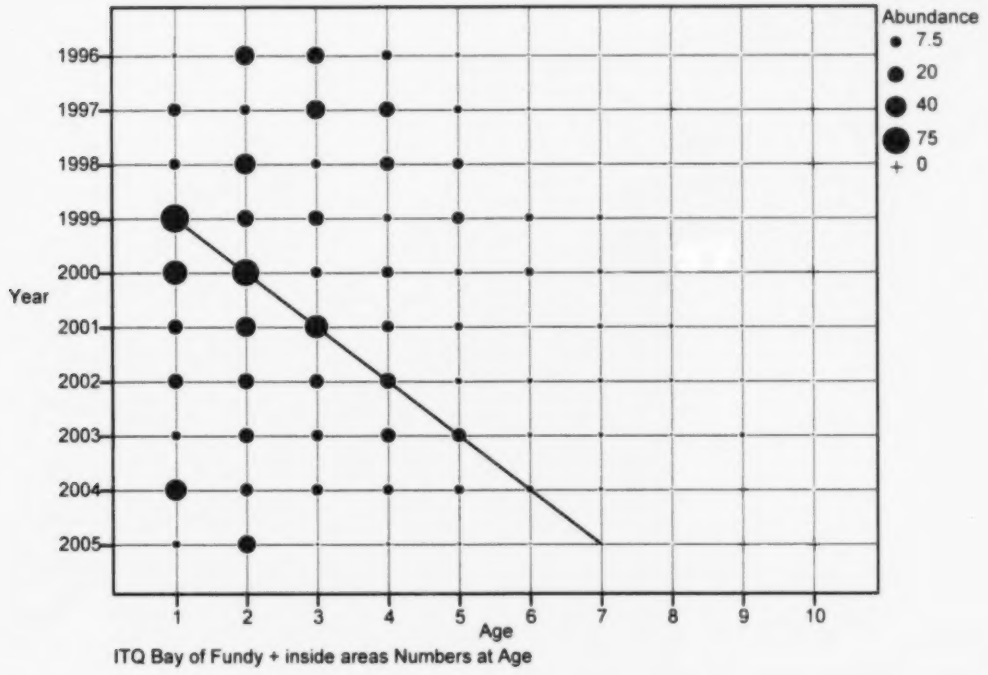


Figure 31. Mean number per tow, mean weight per tow, and ages 4+ weight per tow from the ITQ survey for all NAFO Division 4X strata (upper), and 4+ weight per tow for Scotian Shelf and Bay of Fundy strata (lower).

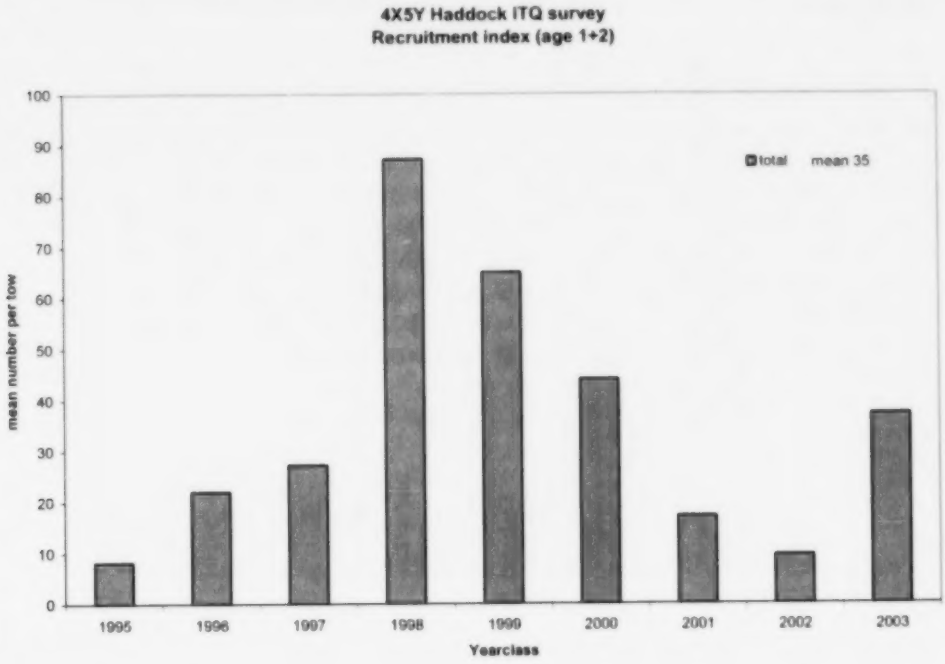


ITQ Scotian Shelf Numbers at Age



ITQ Bay of Fundy + inside areas Numbers at Age

Figure 32. Age composition of ITQ survey indices by area (Scotian Shelf on top, Bay of Fundy on bottom) for NAFO divisions 4X5Y haddock. Solid line tracks 1998 yearclass.



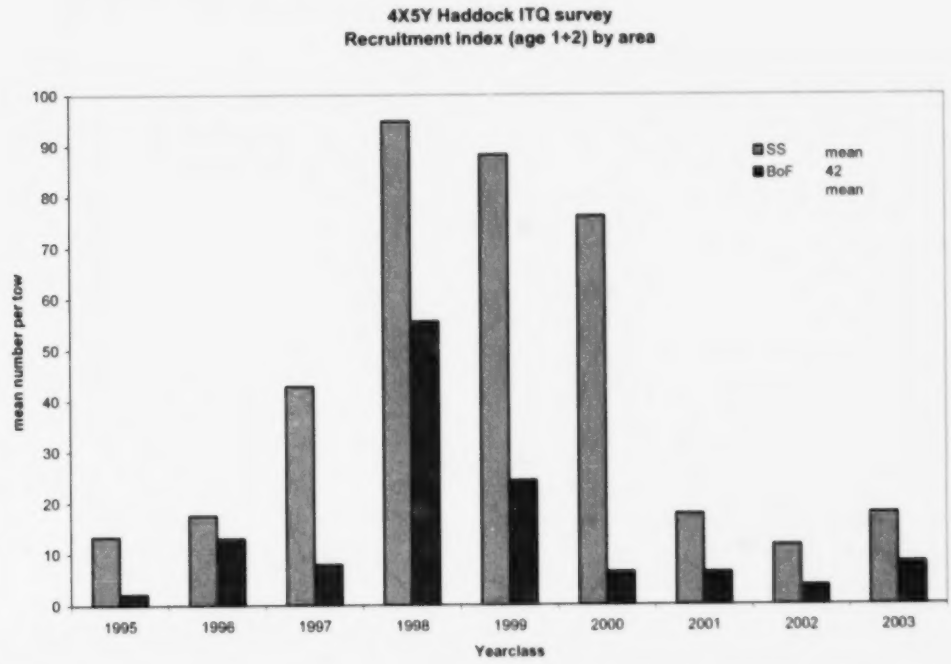
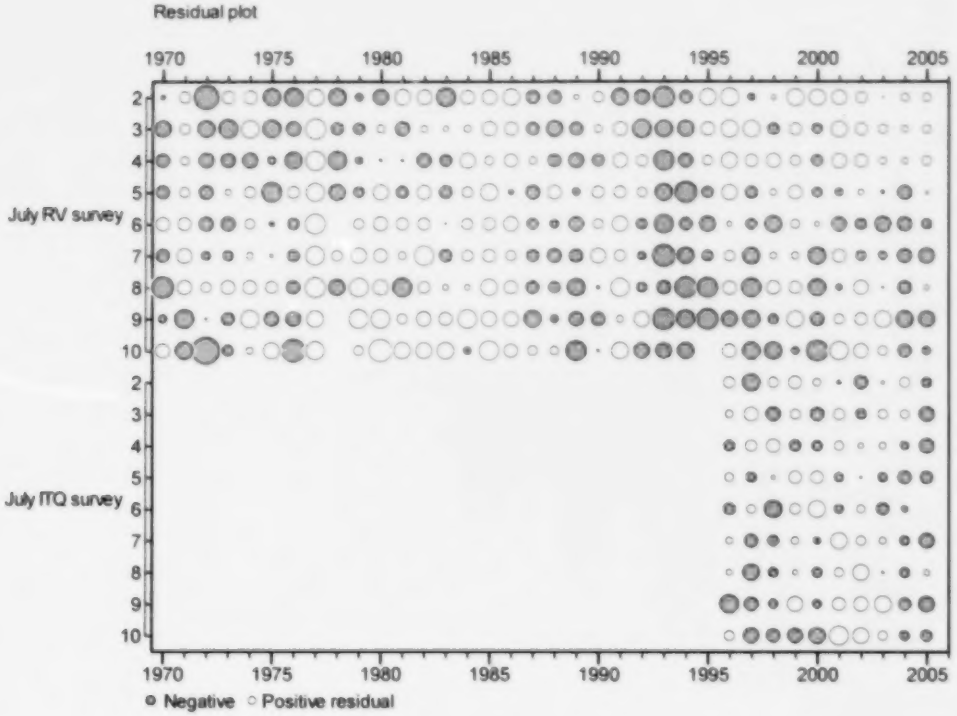


Figure 33. Recruitment indices from the ITQ survey, for all NAFO Division 4X strata (upper) and Scotian Shelf and Bay of Fundy strata (lower).



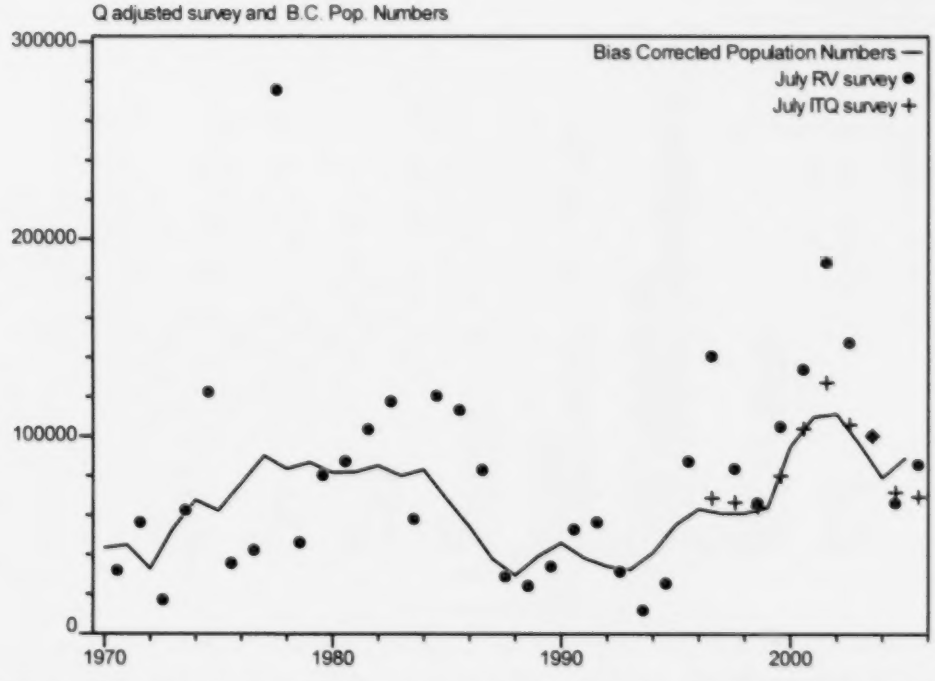


Figure 34. Residuals at age (upper) and population numbers (ages 2-10) estimated from the model and the q-adjusted survey indices (lower).

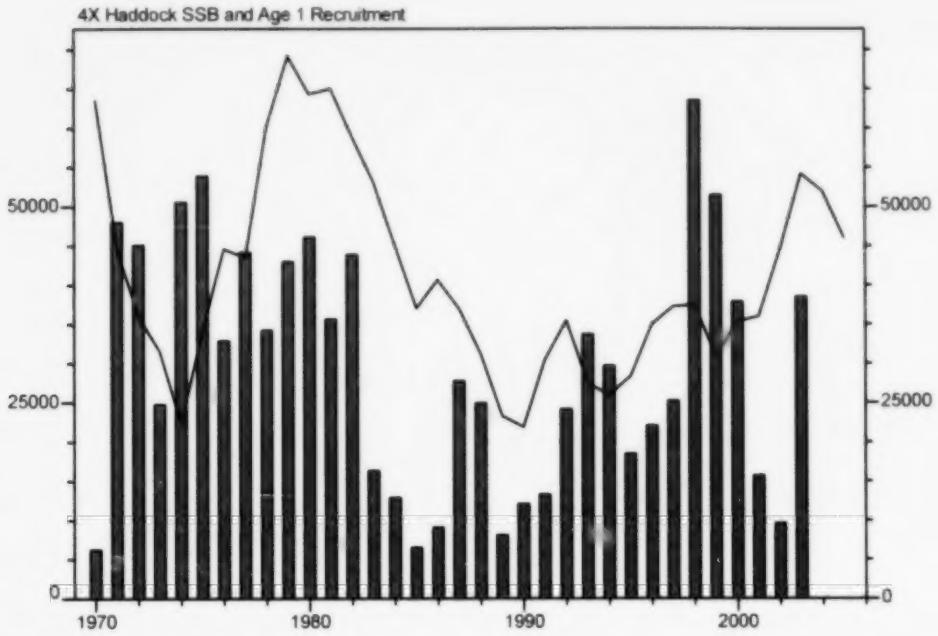


Figure 35. Spawning stock biomass (ages 4+) (line) and age 1 recruitment in the subsequent year (bars).

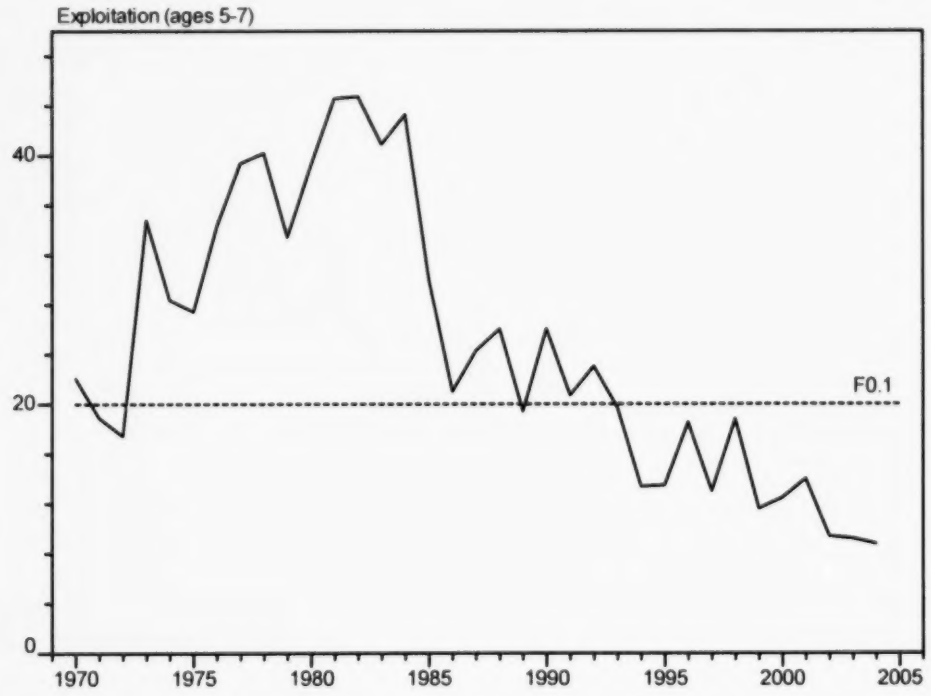


Figure 36. Exploitation rate (ages 5-7) for NAFO Division 4X haddock 1970-2004.

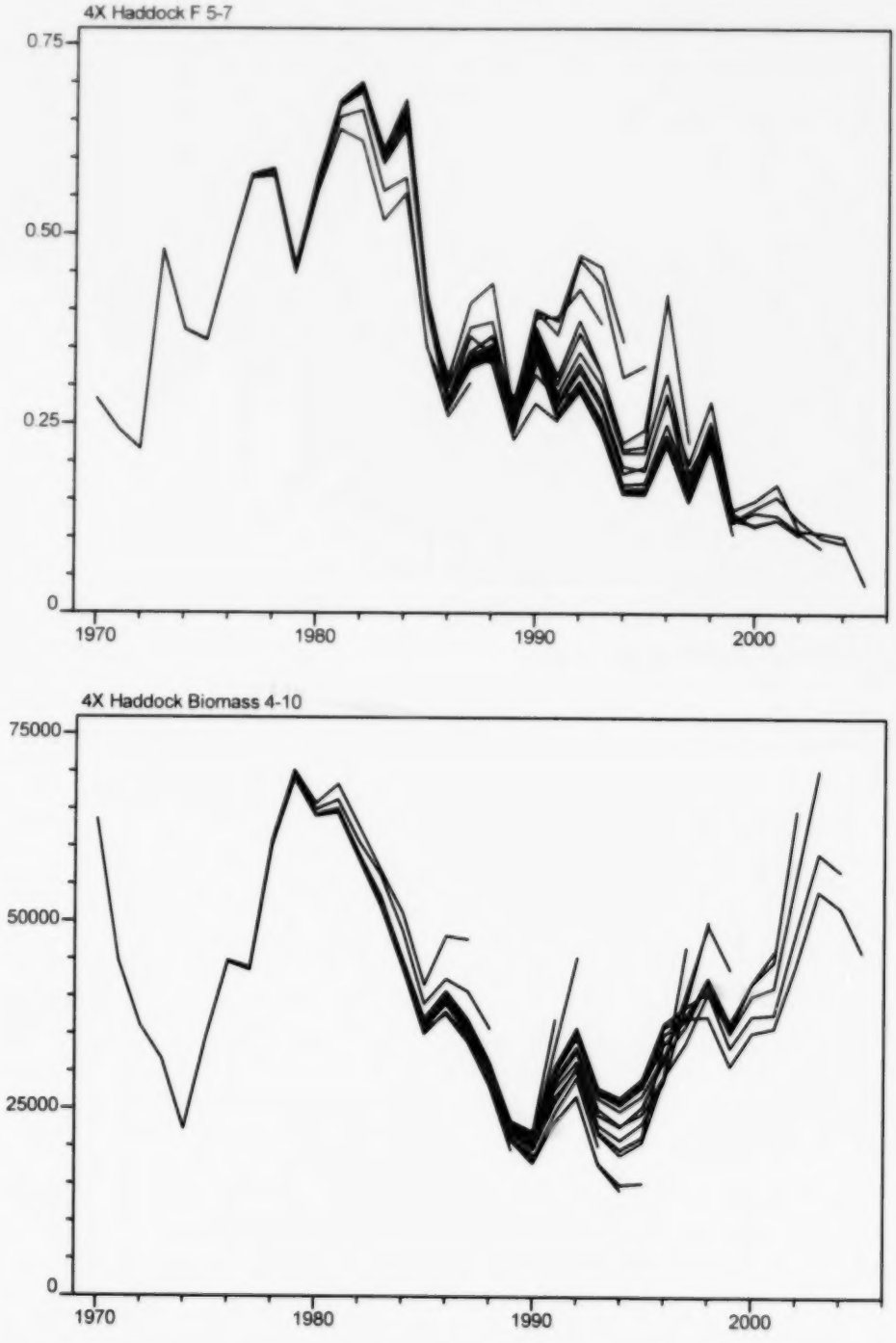


Figure 37. Retrospective analysis of SPA results.

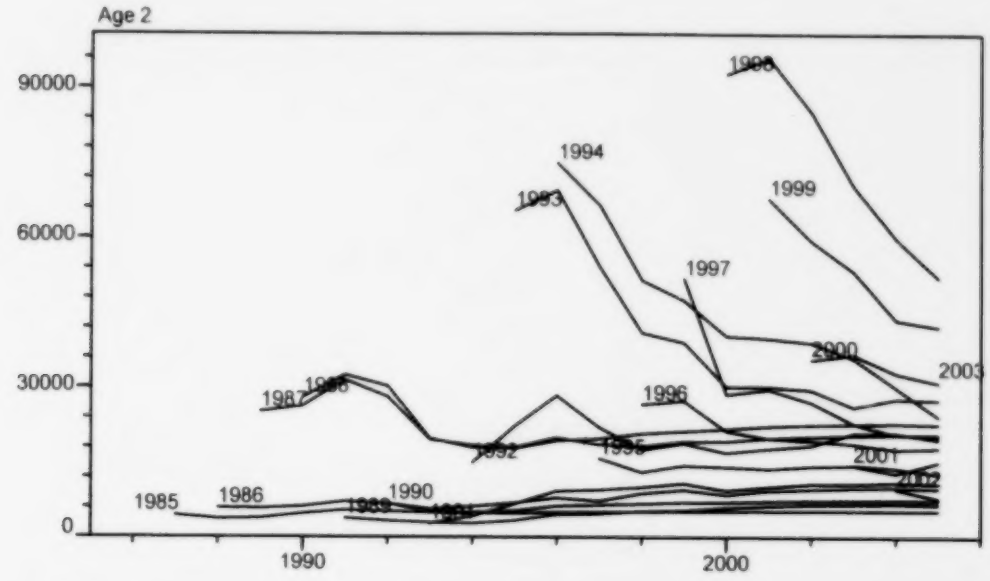


Figure 38a. Successive retrospective estimates of age 2 population numbers for a yearclass from retrospective analysis.

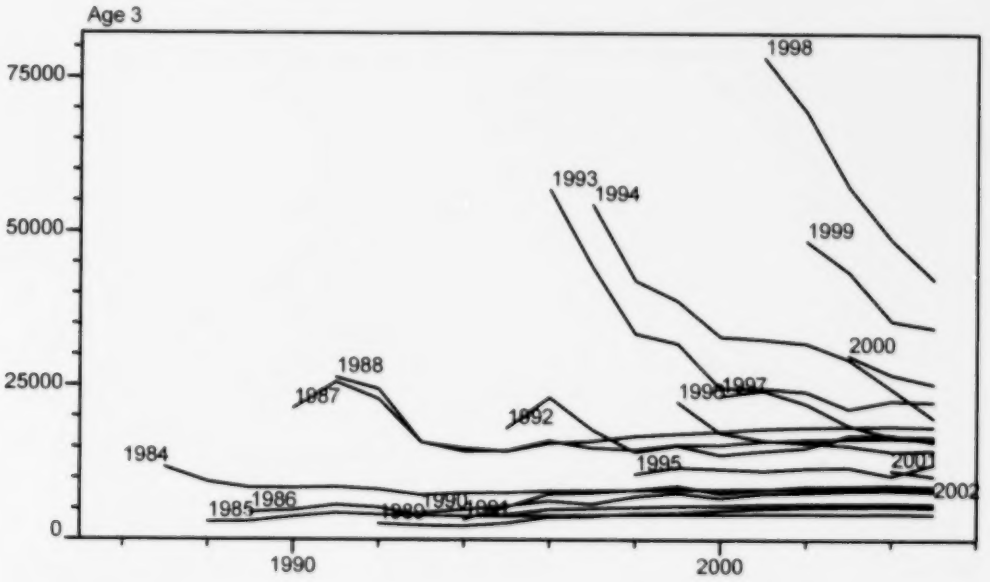


Figure 38b. Successive retrospective estimates of age 3 population numbers for a yearclass from retrospective analysis.

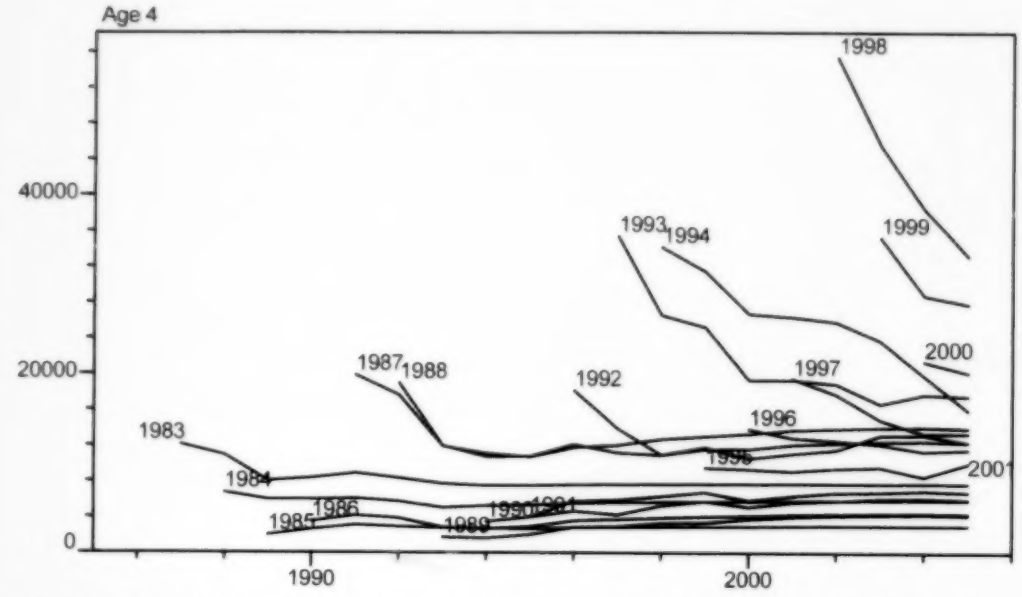


Figure 38c. Successive retrospective estimates of age 4 population numbers for a yearclass from retrospective analysis.

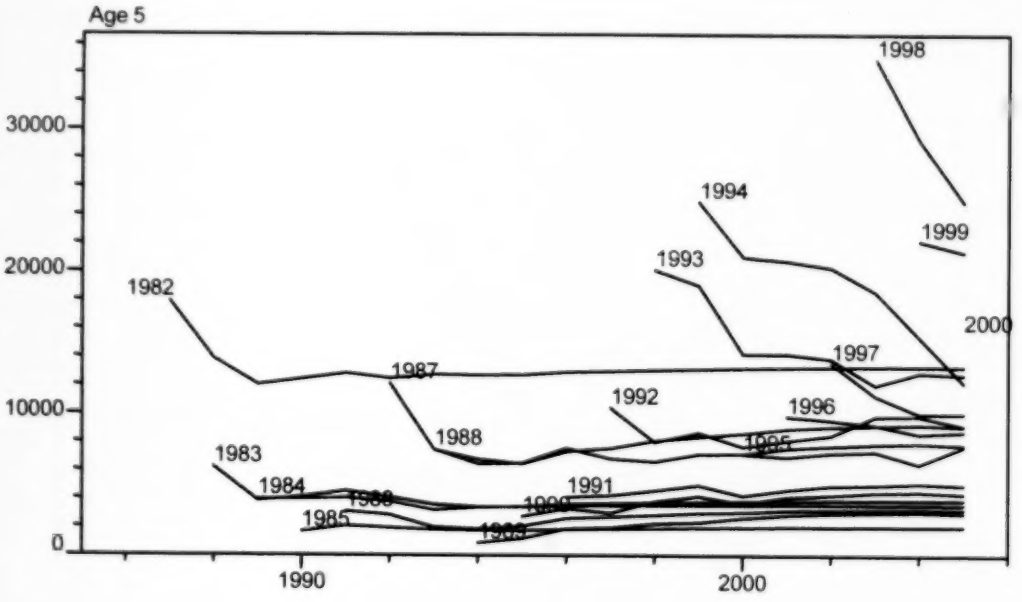


Figure 38d. Successive retrospective estimates of age 5 population numbers for a yearclass from retrospective analysis.

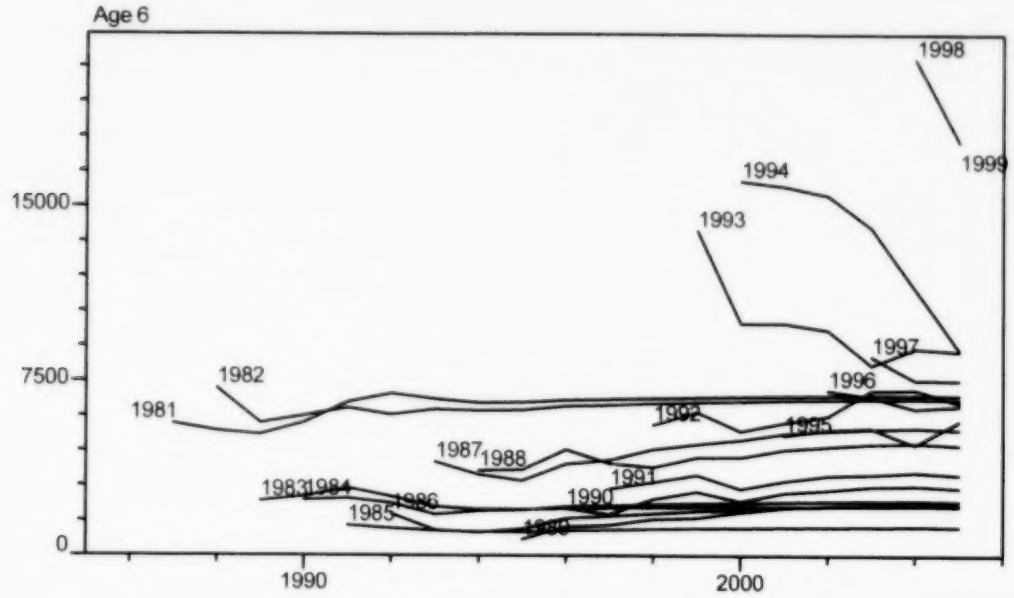


Figure 38e. Successive retrospective estimates of age 6 population numbers for a yearclass from retrospective analysis.

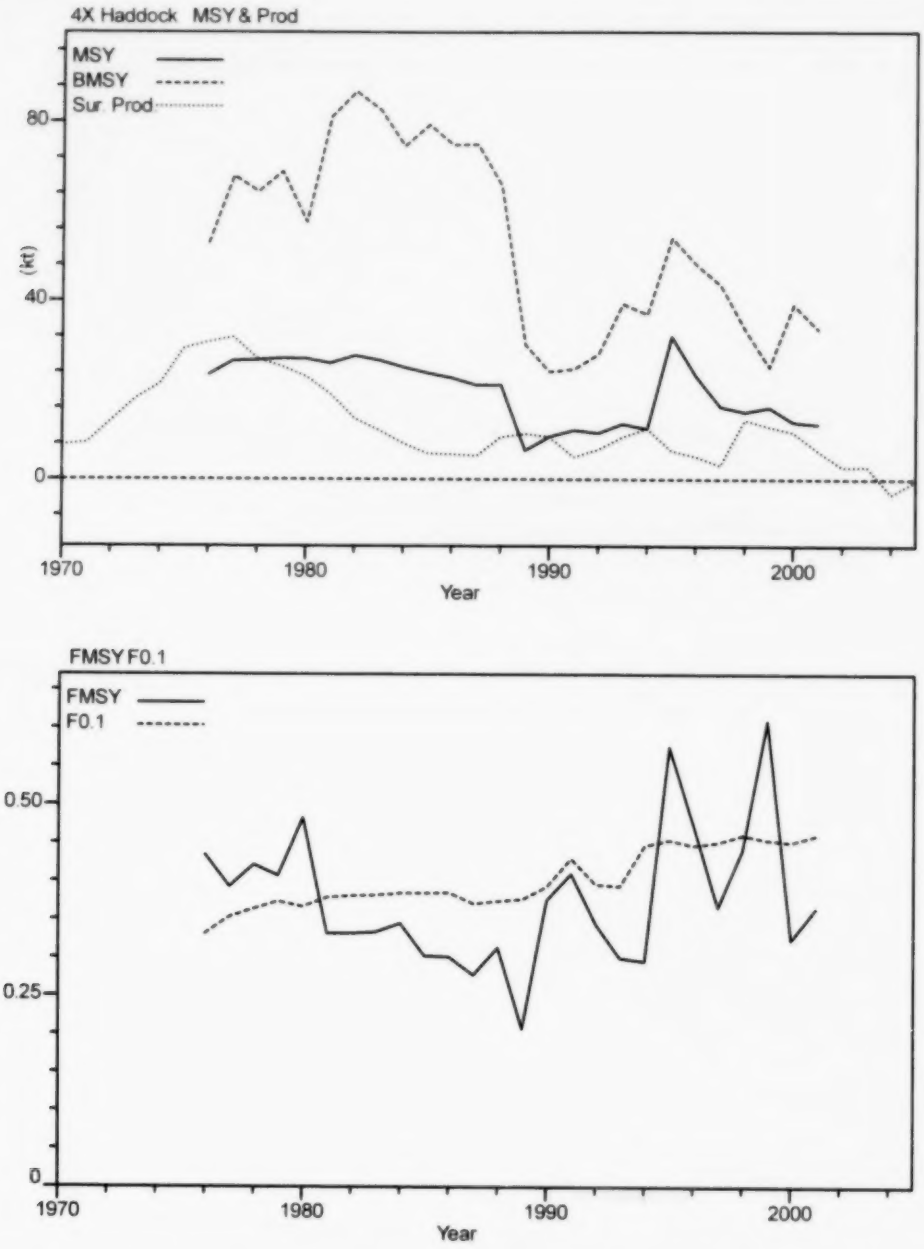


Figure 39. NAFO Division 4X haddock MSY and production estimated using 10-year time frames.

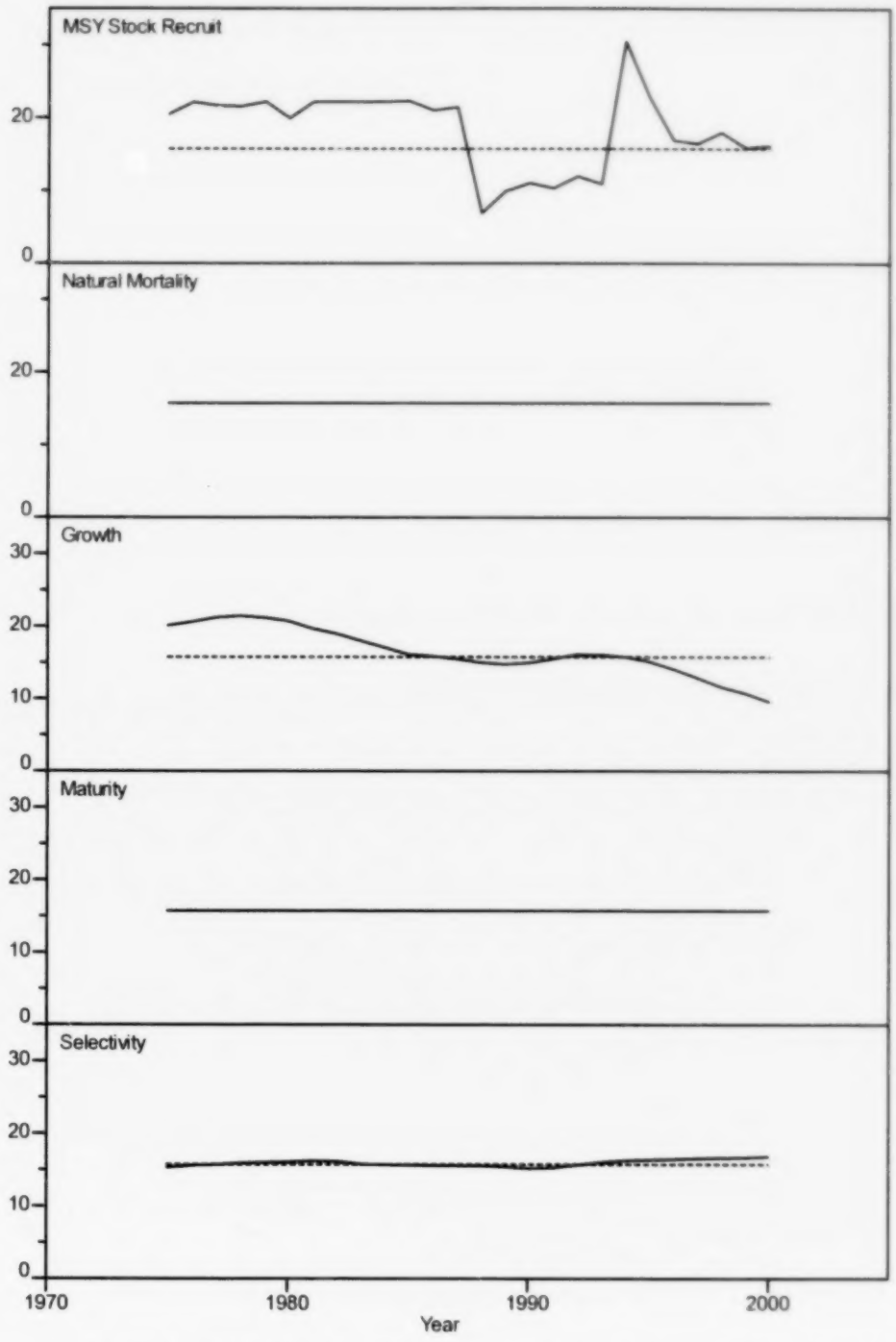


Figure 40. Sensitivity of NAFO Division 4X haddock surplus production model parameters.

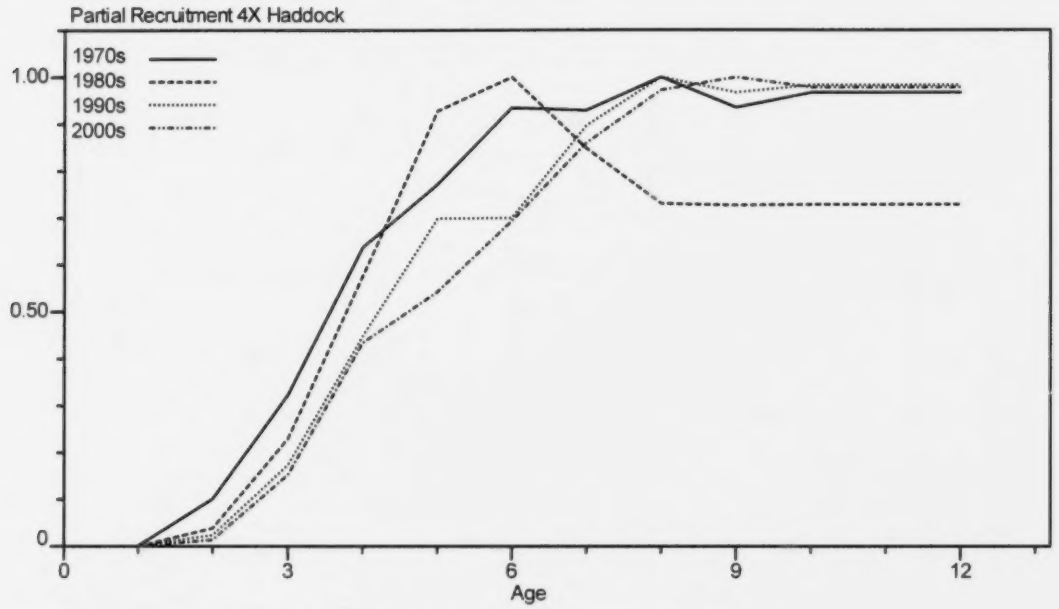


Figure 41. Decadal changes in NAFO Division 4X haddock partial recruitment.

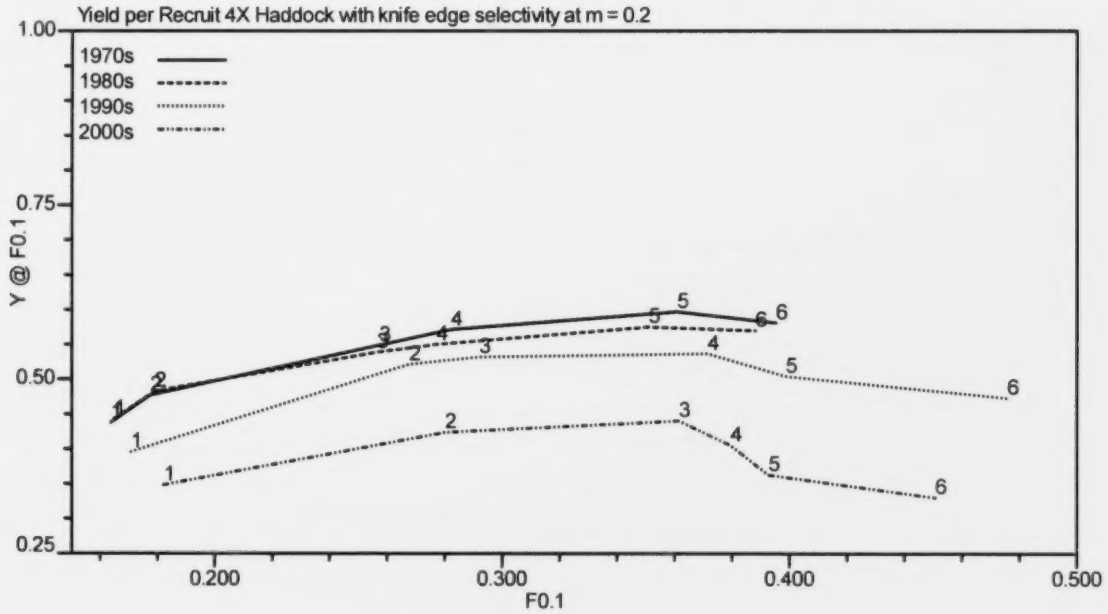


Figure 42. Decadal changes in NAFO Division 4X haddock yield per recruit using knife edge selectivity.

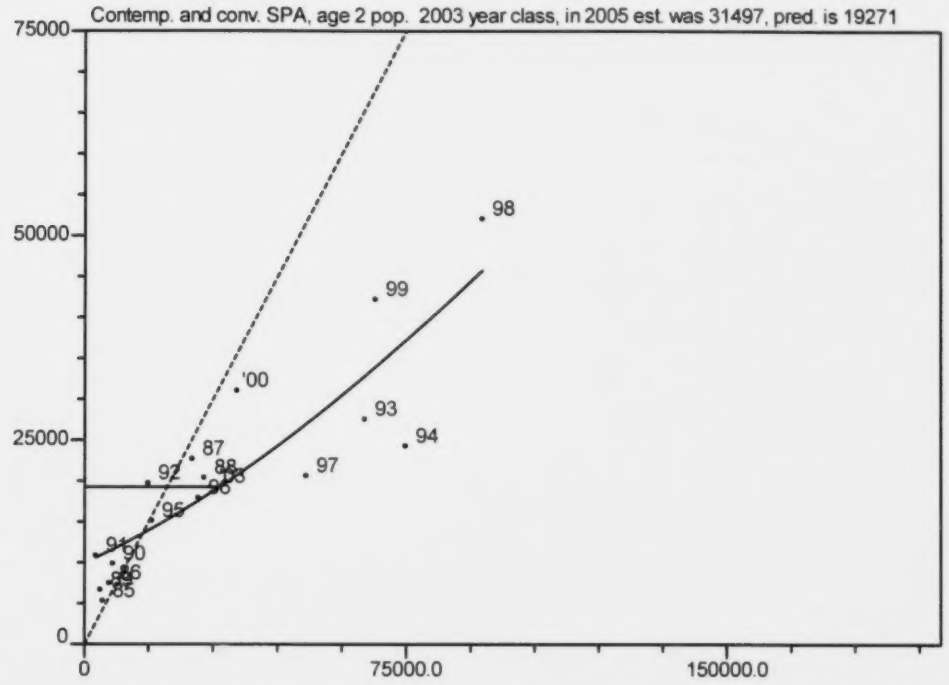


Figure 43. Contemporaneous and converged SPA estimate of the 2003 yearclass (age 2) population numbers from retrospective analysis.

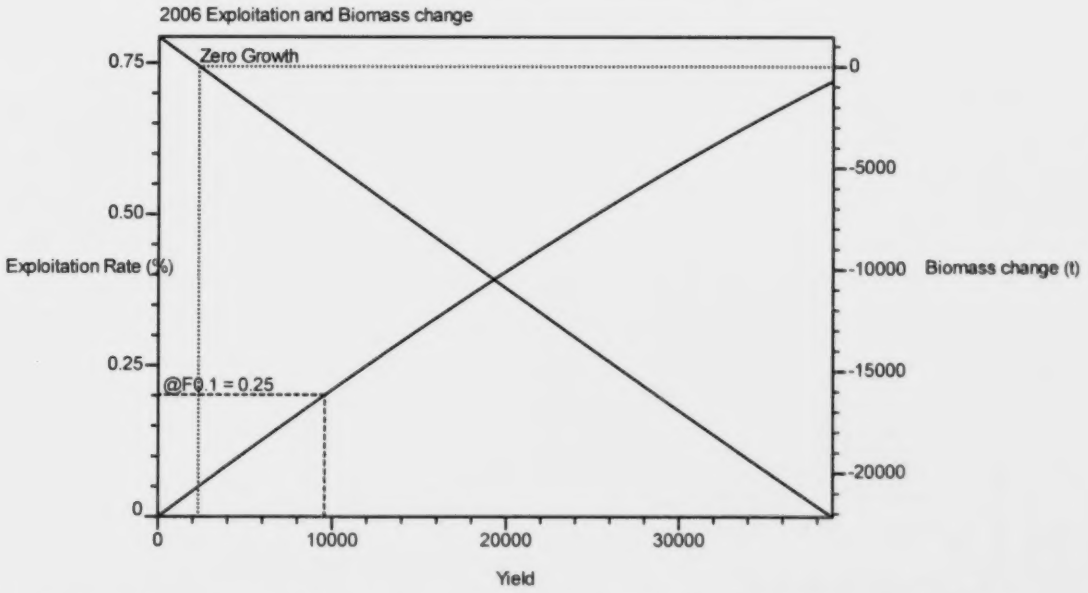
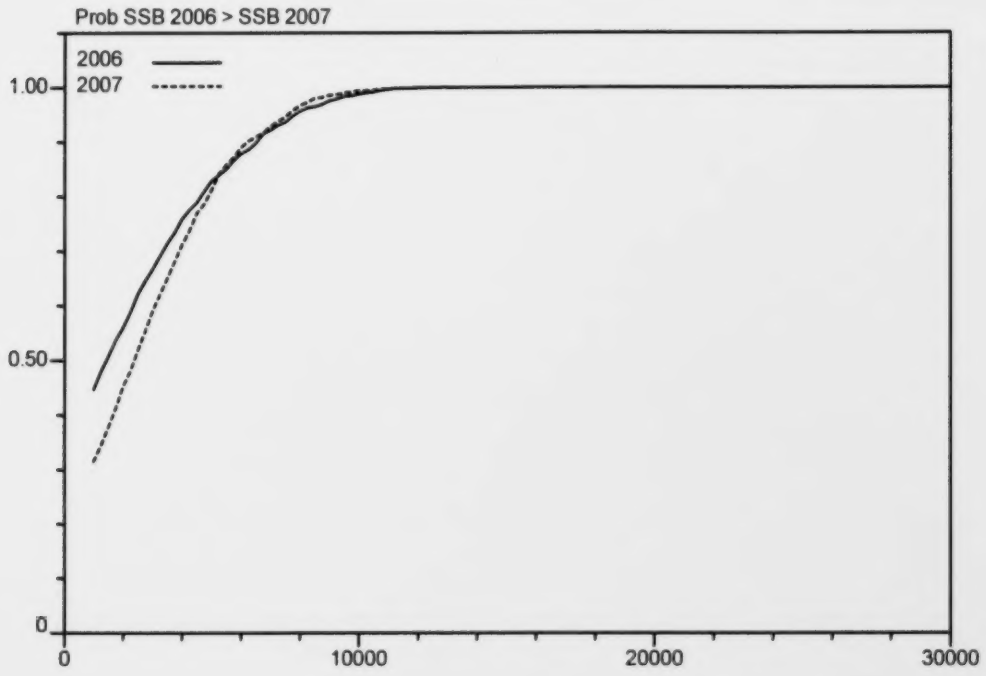


Figure 44. NAFO Division 4X haddock projection showing trajectories of exploitation rate and change in spawning stock biomass at various levels of yield in 2006.



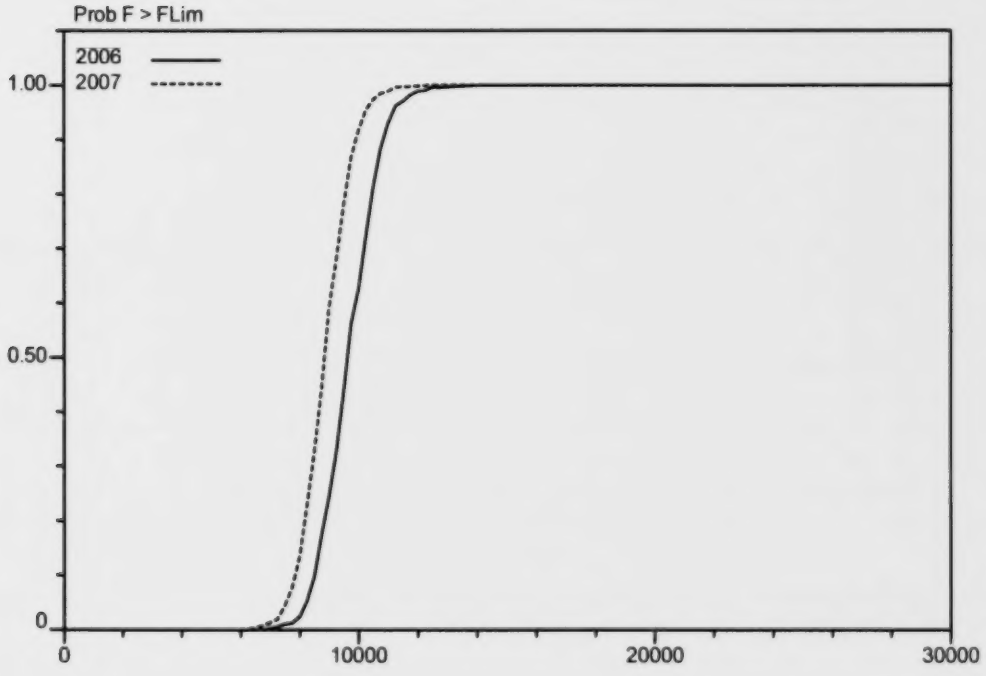


Figure 45. Probability that spawning stock biomass (ages 4+) will decrease (top) and that F0.1 will be exceeded (bottom) at levels of yield in 2006/07 and 2007/08 fishing years.